049303

JPRS-UMA-85-062

20 November 1985

USSR Report

MILITARY AFFAIRS

AVIATION AND COSMONAUTICS

No 7, July 1985

FBIS FOREIGN BROADCAST INFORMATION SERVICE

8
74
A04

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-UMA-85-062

20 November 1985

USSR REPORT

MILITARY AFFAIRS

AVIATION AND COSMONAUTICS

No. 7, July 1985

Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow.

CONTENTS

AIR-FORCE OFFICIAL URGES COMMAND PERSONNEL TO ACCEPT GREATER RESPONSIBILITY

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 1-3

[Article by Honored Military Pilot USSR Col Gen Avn A. Borsuk, Air Forces deputy commander in chief for combat training: "Measure of Responsibility"]

[Text] Results of combat and political training as well as aviation personnel socialist competition in honor of the 40th anniversary of the Great Victory during the winter period of training and for honoring in a worthy manner the 27th CPSU Congress attest to the fact that the military collectives of units and subunits have achieved a considerable increase in combat readiness thanks to a thorough understanding of the complexity and responsibility of the tasks facing them, firm military discipline, organization and cohesiveness, selflessness and purposefulness on the part of each serviceman in military labor, close teamwork and coordination on the part of all echelons of command, control and support.

Just as in the past, Communists and Komsomol members march in the vanguard of competition leaders, by their example of conscientious performance of military duty, zeal and enthusiasm mobilizing personnel to master the heights of professional knowledge and combat expertise and to accomplish thorough mastery of Marxist-Leninist theory -- a powerful ideological weapon in the struggle against the hostile ideology of imperialism. The collectives led by officers P. Zaytsev, A. Kornev, A. Lyskov, A. Mazepo, V. Pismennyy, N. Popov and A. Tsarkov have achieved excellent results in combat and political training.

These subunits' paramount attention is devoted to flight, weapon and tactical training of combat pilots, as well as political and military indoctrination, plus specialized training of personnel. Officers and warrant officers, noncommissioned officers and enlisted personnel are well aware that combat readiness is an objective indicator of the quality of the work performance of each serviceman. It clearly reflects the level of military technical knowledgeability and professional expertise as well as the moral-psychological and physical preparedness of aviation personnel for immediate, decisive actions in the difficult conditions of modern war.

At the same time, seeking to attain high levels of military proficiency, aviation personnel are deeply aware of the fact that combat readiness is a

state which depends on many transient factors: on continuously evolving science, technology, and weapons, the degree of proficiency, moral-political and combat qualities of personnel, excellent discipline and vigilance, and a thorough understanding by each serviceman of his role in defending the interests of the socialist homeland.

As these and other factors evolve and change, combat readiness continuously improves, with new elements being added, elements brought by practical realities and which inevitably dictate a new approach to and new demands on combat training of aviation units. It is quite obvious that one must possess thorough knowledge of the dialectics of societal development, of military and specialized subjects, and apply them correctly in a practical manner in order to meet today's demands, to understand the situation well, to feel the pulse of domestic and international affairs, and correctly to organize the training and indoctrination process.

Experience indicates that different combat collectives, operating identical equipment in identical conditions, produce different and at times sharply differing results during testing and inspection. USSR Minister of Defense MSU S. L. Sokolov states: "This is not due to objective circumstances alone. Everything lies first and foremost in command personnel, in the level of their leadership, in their attitude toward their duties, in their ability to lead others. It is exceptionally important for an officer to be ready and willing to assume the entire burden of responsibility for a decision. This is particularly essential in a combat situation, since one must answer not only for one's decisions but also for the outcome of battle and for the lives of one's men."

As a representative and agent of the party and Soviet State, the one-man commander, regardless of the position he holds, bears personal responsibility for the proficiency and combat readiness of the collective he leads and for everything his men and he himself do. The commander monitors to ensure strict observance of Soviet laws and military regulations and establishes mutual relations with his men and organizes their combat and political training in conformity with Soviet laws and military regulations and within the framework of their demands, supported in his daily activities by the party and Komsomol organizations and the strength of the community. Here too a number of very important, closely interlinked items arise, which determine in large measure a correct and precise understanding by each serviceman of his place in the military aviation collective. What constitutes the commander's responsibility to society, what is the role of the collective in the commander's development, and how does he influence his men's efficiency in carrying out their assigned tasks?

Since relations in our military collectives are organized on a foundation of the requirements of Soviet laws, military regulations and the military oath of allegiance, naturally each serviceman possesses certain obligations and corresponding rights. Consequently, having sworn allegiance to the homeland and to his people, he bears first and foremost legal responsibility, which presupposes that measures will be taken in response to offenses committed within the framework of military regulations or Soviet laws.

At the same time socialist moral and ethical principles prevail in our society, and relations of comradeship, mutual assistance and mutual respect develop. They govern the serviceman's consciousness and conduct in his daily life, job-related activities, and combat work wherever he may be and whatever he may be doing. Thus he also bears moral responsibility to his collective for all his actions and deeds. His moral and ethical countenance, his human qualities, level of self-awareness and thought process, and professional integrity are manifested particularly strongly in his attitude toward his duty, his assigned task, his superiors and subordinates, his comrades and everything around him.

This applies especially to leader personnel empowered to command others, to train and indoctrinate personnel, to issue them orders and instructions, and to verify their execution. Authority and responsibility, both legal, moral, and party, are in an indissoluble unity precisely here. And the higher the leadership position a commander holds, the greater the responsibility he bears before society and the socialist state. This means that a commander should first and foremost thoroughly understand and be deeply aware of what the homeland and party demand of him, that he have the national interest at heart, with the party fervor of a genuine Communist, that he combat any and all manifestations of indifference, complacency, and deceit in all areas of the daily life and combat training of the military collective he leads, that he not permit a discrepancy between word and deed, that he not fear to accept full responsibility for a decision he has made or order he has given, that he consider the opinion of the collective, that he teach it and learn from it, and that by personal example he inspire his men to accomplish difficult combat training tasks.

Aviation units and subunits in our Air Forces are headed as a rule by highly-educated, ideologically conditioned, politically mature combat pilots. They possess a consummate mastery of combat equipment and weapons, are well trained and prepared in an operational-tactical respect, and skillfully pass on their knowledge and experience to their subordinates. They are distinguished by personal modesty and sociability as well as a strict attitude toward themselves and their subordinates in solving any problems which arise.

Fairly recently, for example, Military Pilot 1st Class Lt Col G. Fokin took over command of a unit. The collective under his command successfully accomplished the combat training tasks of the first period of training and is presently working hard to complete the year's tasks. We shall state frankly that in the past this unit did not enjoy any particular degree of success in combat and political training. The new regimental commander and his deputy commander for political affairs specified a number of organizational measures in connection with this, and the staff officers sought to ensure that subunit personnel mastered their job duties well and had a clear idea of the ultimate performance level they were to reach by year's end. The party and Komsomol organizations went to work, giving much assistance to the command authorities and actively influencing the course of combat training and socialist competition.

Firm observance of regulations has been established in the unit, solid discipline and a healthy moral atmosphere are being maintained, which is

helping personnel achieve excellent quality in their military training and steadily improve their job-related skills and combat readiness. A methods council is in active operation, which discusses urgent matters pertaining to flight training methods, tactics and combat employment, equipment maintenance and flight operations support, as well as training of instructor personnel.

Special attention is devoted to selection and placement of cadres. Candidates are thoroughly discussed, for example, for promotion to the position of flight commander or servicing and maintenance group chief. Principal attention is focused on professional competence and methods abilities as well as the ideological-moral and psychological qualities of a candidate for promotion. Following assignment to a new position, the development of a young leader is continuously monitored by the command authorities, but without excessively close, petty supervision, which develops in the novice commander passivity, lack of initiative, sluggishness of thinking and, ultimately, a lack of responsibility as well. The young commander obtains from his older and more experienced comrades requisite counsel, recommendations and advice on how best to proceed in difficult and debatable matters, but he makes the decision himself, in conformity with his authority and responsibility. Thus a solid foundation of forming and shaping command cadres is laid down. This also comprises a party-minded approach to things.

Experience indicates that if a commander treats the collective and each member with respect, the collective will reciprocate. Lt Col G. Fokin went through all stages of professional growth in his regiment, becoming very close to the collective, knows each individual well, and each man knows him as a decent, responsive person, a solicitous commander and an excellent pilot. It is therefore not surprising that the men received the news of his appointment to the position of regimental commander as the most self-evident, logical fact. The commanding officer has succeeded in sparking the interest of the collective, in focusing it on accomplishing large and responsible tasks, while the men, clear about what is required of them and profoundly aware of the significance of their labor, have concentrated all efforts on achieving the stated goal. The process of gradual but sure advance by the collective and its commanding officer began in a situation of close contact, with mutual influence on one another. This is attested by the results of performance evaluation for the first six months, during which aviation personnel displayed stable results in all categories of combat and political training. Personnel intend to achieve even higher performance levels, devoting principal attention to quality of training.

At this point we should like to mention that the commanding officer, who possesses good organizer abilities and is equipped with progressive ideas, unquestionably can accomplish a great deal. The collective in turn, deeply aware of the significance of these ideas and embracing them as their own, can achieve more. With correct leadership and mutual persistence, success is achieved much more rapidly and with less expenditure of effort and resources. But a mistake is being made by that commander who considers that all the achievements of his men are entirely due to his own position and organizer abilities. It is precisely the collective which, by its labor, raises him higher, creates his authority, and bears moral responsibility for this. He must understand this well, appraise his work performance self-critically, in a

party-minded manner, in order not to take total credit for the achievements of the collective and not to come into conflict with it. Otherwise subordinates will quickly grasp the motives behind their leader's conduct and will not forgive this breach of trust. Thus the conscience of the commander and the conscience of the collective become the principal measuring stick of ethical and moral actions and aspirations as well as mutual moral responsibility.

In conditions of a steady increase in the scale and complexity of the combat training tasks performed by aviation units and subunits, the role of responsibility for the results of one's labor is steadily growing. The modern fixed-wing or rotary-wing aircraft is a crew-served weapon. It is readied for flight by a large number of specialist personnel, and on each individual depends the reliability and efficiency of an aircraft, and consequently success in accomplishing the combat mission and flight safety. Particularly important here is coordination of the actions of all persons involved in preparing for and supporting flight operations, constant composure, firm discipline and flawless efficiency on the part of each serviceman. The labor of a large collective is completed by the pilot and aircrew in carrying out a specific mission. Precise observance of the rules and regulations governing flight operations ensures a satisfactory outcome. But a situation can develop in the air where one must display initiative, firmness of spirit, resoluteness, and the ability to assume responsibility for the job at hand. I shall cite the following incident in connection with this.

A squadron assigned to the limited contingent of Soviet forces in Afghanistan was conducting scheduled training sorties. The sun was dropping toward the mountain peaks when a pair of fighters took off, with Military Pilot 1st Class Lt Col M. Stepanov flying lead. After takeoff the element leader reported initial data to the tower and proceeded to execute the training mission. The flight was proceeding smoothly, and no complications were anticipated. From the aircraft's vantage point they had a clear panorama of mountain ranges with peaks glistening in the rays of the setting sun, gorges and rock clefts, and the white ribbon indicating the highway leading to the capital of the DRA.

Suddenly the element leader caught sight of heavy black smoke dead ahead. Descending, he spotted on the road a long column of trucks heading toward Kabul, with a gasoline tanker truck in flames in the middle of the column. His sharp gaze instantly spotted flashes of gunfire on a mountainslope and took note of prominent terrain features.

"Eleven, do you see it?" Stepanov queried his wingman.

"Affirmative! The dushman [bandits] are attacking. It looks like heavy caliber," replied Lt Col V. Yevtukhov.

It was quite obvious that the truck column was under bandit attack. Down there below them people were dying and supplies intended for the Afghan people were being destroyed. Our pilots could not permit this to happen, as their aircraft were armed.

Stepanov reported the situation by radio back to the command post and requested permission to attack the weapon positions. Instructing his wingman

to assume the required formation, he swung into a turn and looked for the ground reference point. He had not yet received from the ground permission to attack. He could not wait any longer. The element leader put his aircraft into a dive and radioed his wingman: "I am attacking!"

A heavy delivery of fire silenced one of the weapon positions. Lieutenant Colonel Yevtukhov hit the other with an accurate, devastating delivery of fire. The pilots then flew another strafing pass, putting cannon fire into the area from which the bandits had been firing.

Lieutenant Colonel Stepanov acted as a genuine patriot and internationalist, called upon to defend a righteous cause, and therefore did not doubt for a single second the correctness of his decision. Quite frankly, the responsibility assumed was excessive, but he was unafraid to accept it, for he understood well the predicament of the people who were under bandit machinegun fire.

Each and every decision, flexibility, efficiency and firmness of command and control depend first and foremost on how solidly the commander has mastered his job. And this in turn is grounded on thorough knowledge of military affairs and the ability precisely to gain one's bearings in a vast flow of contradictory information and quickly to evaluate the developing situation. Unfortunately not all officers have become thoroughly aware of the role of diversified knowledge in the system of combat training, command and control. I encountered something quite unpleasant, for example, at a performance evaluation. Certain officers of a fairly high leadership level displayed poor knowledge of certain specialized subjects, while others were even unable intelligently to explain their direct job duties. It is clearly appropriate to state the reminder that an officer, if he does not possess thorough knowledge, does not have the moral right to place high demands on his subordinates in this regard. And how can one demand if one does not know what to demand? How can one manage one's unit and its affairs if one does not know the state of these affairs? But people clearly grasp the ability of others, and they respond appropriately to unintelligent demands. One thing is clear: with a commander who does not know his job, sooner or later there will arise a conflict both with his outfit and himself, since incompetence presents fertile soil for the development of arrogance, haughtiness, and disregard of others. One can be assured that in an emergency situation such a commander will be unable to take responsibility and make the only right decision, but will attempt to hide behind someone else's back.

Essentially this is nothing other than irresponsibility toward one's duty, toward the collective one leads, and toward our society.

Under no circumstances can we accept such a state of affairs, because this does harm to our common cause -- a high state of combat readiness. As was stressed at the April (1985) CPSU Central Committee Plenum by CPSU Central Committee General Secretary M. S. Gorbachev, "it is essential to be more demanding on each party member for his attitude toward his duty to society, for his execution of party decisions, and for an honest and pure countenance of a party member. A Communist is judged by his actions and deeds. There are no and can be no other criteria." Commanders, political workers, and staff

officers must make every effort to raise combat training to a new qualitative level, to ensure that all aviation personnel are inspired to raise the level of their military and specialized knowledge. It is essential to raise the efficiency of all aviation personnel, and especially leader personnel, to the highest level. It is impossible to become a good commander without learning obedience. It is important gradually to develop in people a sense of the new, meaningful job-related qualities, initiative and the ability to assume full responsibility for one's own actions and those of one's subordinates. These are large and important tasks of political and moral indoctrination of all categories of aviation personnel.

As we draw closer to the 27th CPSU Congress, Air Forces personnel are working hard to meet combat training targets and socialist pledges. Military aviation personnel are working intensively to improve their air proficiency and combat skills, their moral-political and psychological conditioning, are strengthening discipline and organization, and are increasing their vigilance and readiness to take resolute countermeasures against any and all intrigues by the enemies of our socialist homeland.

3024
CSO: 9144/642

RECONNAISSANCE MISSIONS IN TACTICAL AIR EXERCISE

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 4-5

[Article, published under the heading "Be Alert, in a Continuous State of Combat Readiness," by Military Pilot 1st Class Lt Col V. Vasilkov: "On the Eve of an Exercise"]

[Text] A tactical air exercise is not only the highest form of flight training but also always an important examination for aviation personnel and a test of the preparedness of aviation subunits, their command and control entities to carry out combat missions. A tactical air exercise was conducted in conditions maximally approximating actual combat in the squadron commanded by Lt Col G. Ryabukha. The exercise was preceded by a great deal of painstaking preparation not only on the part of subunit personnel but also the unit headquarters staff.

The experienced officer-leaders realized that success in accomplishing mock combat missions depends first and foremost on how thoroughly the tactical air exercise scenario has been thought out, how detailed its plan of execution is, and how thoroughly the men have rehearsed their tasks and worked out measures aimed at ensuring flight safety. The high professional level of the regimental staff officers led by Lt Col V. Gorodnov enabled them to prepare in a prompt and timely manner the organizational-methods documents for the exercise. This was also fostered by the unit commander's comprehensively substantiated plan. He succeeded in evaluating and taking into account numerous factors which could affect preparation for and conduct of the tactical air exercise.

The tactical environment conformed first and foremost to the subunit's missions, the level of proficiency of squadron flying personnel, engineers and technicians, specialist personnel of maintenance and support subunits, and also took into account the specific features and complexity of the international situation.

The fact that the military forces of the aggressive imperialist nations are adopting mobile weapons with a high degree of destructive capability dictates the need to improve the training of reconnaissance aviation aircrews and subunits for the conduct of combat operations, for success in today's combat,

as we know, depends in large measure on promptly providing command authorities and headquarter staffs with intelligence on the adversary.

Aerial reconnaissance is capable, in a complex and dynamic environment, of rapidly obtaining requisite intelligence, including the location of hostile offensive nuclear missile weapons and other small mobile targets, and of promptly communicating this information to appropriate headquarters. The squadron would be performing such a mission during the tactical air exercise.

According to the plan of the exercise, aircrews would be flying to another airfield and then carrying out their assigned mission.

The squadron commander made the optimal decision, briefed his aircrews in detail on the mission, and checked the subunit's readiness to proceed.

Receiving the go-ahead signal from the tower, the squadron commander was the first to take off. Lieutenant Colonel Ryabukha was well aware of how important a commander's example is to his men. They had made socialist pledges to perform on the ground and in the air with not less than a mark of excellent during the period of the tactical air exercise. To ensure undetected passage, they flew a variable-altitude flight profile, with limited radio communications. They made a low-level approach to the destination field.

The flight had been successful. The intelligence acquired en route made it possible promptly to discover "aggressor" preparations for combat. The real test was near. While flight personnel update-briefed their missions and studied the situation on maps and plotting boards, the equipment and ground maintenance specialists, under the guidance of Maj N. Tyukhtin, readied the aircraft to go up again, promptly and with a high degree of reliability, dispersed and camouflaged them.

Considerable attention was devoted to moral-political and psychological training of aviation personnel. The squadron deputy commander for political affairs, Capt S. Nikitin, realized that accomplishment of the exercise missions would be substantially influenced by the effectiveness and quality of party-political work. He therefore assigned party and Komsomol activists in advance, working together with the party organization secretary, and conducted a briefing session. This enabled aviation personnel continuously to be brought up to date on the subunit's activities. And although the successes of vanguard performers in the process of preparing for and conducting the tactical air exercise were continuously communicated to personnel with the aid of the wall press, party member S. Nikitin found time to talk to the men, focusing them in their work toward a high degree of organization and mutual assistance.

Considerable importance was attached to tactical training, full utilization of the combat capabilities of the aircraft, and increasing reliability of accomplishing suddenly-arising missions in conditions of heavy countermeasures by "aggressor" air defense weapons and massive enemy employment of jamming. When the aircraft commanders reported completion of pre-mission preparations, their readiness was checked. This included checking to make sure they

correctly understood the mission and had come up with a correct mission execution plan. In addition, the verification was of considerable indoctrinational significance and helped the men gain confidence and an excellent psychological mood. The aircrews consisting of Capts S. Shershnev and A. Shreder, V. Reshetnikov and V. Sinitsyn reported their decisions with confidence and substantiated their decisions in a well-reasoned manner.

The "aggressor" commenced combat operations at dawn. The squadron commander briefed the aircrews on situation changes. Aircrews marked on their flight charts the designated route corridor, refined data on the location of "aggressor" air defense weapons according to the most recent intelligence update, and detailed mutual recognition signals to be used with ground troops.

A signal flare streaked through the morning sky. The aircraft manned by Lt Col G. Ryabukha and Maj V. Larionchik took off. Soon the reconnaissance aircraft, flying at low altitude and at maximum speed, maneuvering and employing airborne ECM gear, penetrated the "line of contact" and proceeded to look for targets. Their mission was to find "enemy" offensive nuclear missile weapons. They would be flying the shortest route to their designated area right into the rising sun, which made detecting targets much more difficult. In addition, the "adversary" could expect an airstrike from that same direction with the greatest probability. Therefore Ryabukha, following the plan devised on the ground, turned in the direction of a marshy area. This prevented the "aggressor" from figuring out the aircraft's intentions. Subsequently the reconnaissance aircrew, skillfully utilizing the topography, entered the target area from the direction of the sun, gaining the element of surprise. Executing a vigorous vertical maneuver, the pilots spotted a missile launcher. Squadron navigator Maj V. Larionchik determined the target coordinates and radioed precise intelligence back to command. The aircraft pulled out of the dive, executed evasive heading changes, and proceeded homeward at low altitude.

The crew consisting of Capts A. Smetskiy and S. Nikitin also did a successful job. They reconnoitered an "aggressor" airfield. Turning to his final heading, the pilot set up optimal conditions for the aircraft's intelligence-gathering gear. Reconnaissance pilots require enormous self-control when it seems that an airfield's entire air defense assets are directed precisely at their aircraft, and yet they must hold their flight parameters! Seconds last an eternity. But finally they switched off the equipment and executed an evasive maneuver.

While departing from the target, the reconnaissance aircraft was attacked by an "enemy" fighter. The aircrew succeeded in executing a bold, unexpected maneuver and evaded pursuit. The obtained intelligence was promptly transmitted. The assigned mission had been successfully accomplished.

Thus in the course of the tactical air exercise squadron personnel improved their tactical and flying skills and substantially boosted aircrew and subunit combat readiness. Contributing to this to a considerable degree was thorough preparation for the exercise, compromising with realism to a minimal degree in the training process, and thus maximal approximation of the pilot's actions to

a genuine combat environment, which is fully in conformity with the basic principle of tactical training: teach troops that which is needed in war.

How could it be otherwise, for the reconnaissance pilot is not only a competent, professionally-trained officer with broad political knowledgeability. He is a warrior, prepared to engage a strong, excellently armed, persistent and crafty adversary. In the daily routine of military training he learns to make maximum use of the capabilities of his aircraft, studies Soviet and enemy tactics, works on mastering techniques and methods of detecting various targets and delivering an accurate strike, and develops in himself determination, daring, the ability to take an intelligent calculated risk, and combat boldness. I should like to state that genuine boldness has nothing in common with dashing recklessness, based on the hope of sheer luck. One cannot possibly count on success in such a case: aviators can expect serious errors and unwarranted losses.

In an article entitled "Risk and Calculation" (AVIATSIYA I KOSMONAVTIKA, No 4, 1984), the author stressed that in order to determine the degree of risk, as well as to substantiate an optimal mission variant, one must simulate various situations and take into account the crew members' knowledge, skills, experience, and moral-fighting qualities. The squadron's aviators devoted attention to the points and conclusions contained in this article during preparation for and conduct of the tactical air exercise, and for good reason, because in reconnaissance it is especially important to combine risk with precise calculation, boldness with caution. This approach promoted to a considerable degree the excellent quality and safety of execution of aircraft missions.

The crews of Lt Col G. Ryabukha and Capts V. Reshetnikov and A. Smetskiy were named among the top performers according to the results of the tactical air exercise. The subunit's excellent success was a result of the fact that unnecessary situation simplification was not permitted in the course of daily aircrew training in organization and conduct of flight operations. Unit leader personnel continuously monitored progress in training. Officers V. Kirilenko, Yu. Lentyugov, G. Andryushchenko, V. Filimonov, N. Makarevich, and G. Sokolov, for example, actively assisted the commanding officer in synthesizing and disseminating advanced know-how, displayed an example of objective evaluation of achieved results, and sought out reserve potential for improving the training of personnel, the professional skills of subunit commanders, and for increasing the effectiveness of personnel competition rivalry.

Incidentally, organization of socialist competition among squadron personnel constantly occupies the center of attention of the party and Komsomol organizations. Competitiveness in the training and indoctrination process helps subunit aviation personnel achieve excellent results in military labor month after month. This is also indicated by the results of the exercise.

Painstaking study by subunit personnel of combat experience from the war and its innovative utilization in present-day conditions also helped achieve successful accomplishment of the missions in the tactical air exercise.

The experience of the exercise also indicated that a high degree of personnel preparedness to carry out unexpectedly arising mock combat missions is the foundation for success in today's air combat, for the conduct of which it is necessary to train and prepare thoroughly and persistently. This is demanded by the interests of defense of the homeland. This is the sacred duty of all aviation personnel.

3024
CSO: 9144/642

FAMILY'S MILITARY AVIATION TRADITION RELATED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 8-9

[Article, published under the heading "Aviation Dynasties Serving the Homeland," by Maj P. Grinyuk: "Call of the Heights"]

[Text] I met Military Pilot 1st Class Maj Yu. Roslyakov in the pilot briefing room. In the breaks between training sorties, Yuriy Anatolyevich enthusiastically talked about combat training and his aviator comrades. He said little about himself, but I learned a great deal about him from his superiors and colleagues. They told me that this energetic officer was a capable pilot, a thoughtful indoctrinator of his men, that he had gone through a fine school of combat proficiency and had carried out his internationalist duty as a member of the limited contingent of Soviet forces in Afghanistan. He was awarded the Order of the Red Star. He recently received a promotion. In short, officer Roslyakov is confidently following a tried and true course, gaining altitude.

Choice

People's destinies develop in different ways. Some spend a long time looking for their niche in life, while others immediately make their choice and remain faithful to it right to the end. There was no debate in the Roslyakov family: what should the boys become? Officers, of course! Just like their grandfather -- a battalion commander from the war years. Pilots, of course! Like their father -- a military aviator and reserve lieutenant colonel.

From their early years Yuriy and Igor learned to know military life and worry about their father -- a regimental senior navigator -- had seen the difficulties of his profession and had appraised its significance. It was then that they first had the dream of serving in military aviation. This dream took on increasingly more specific outlines with each passing year. This was promoted to a considerable degree by Anatoliy Pavlovich's stories about Air Forces routine and flying activities. The father noticed with pleasure the attentiveness with which his sons listened to him. The boys were also enthralled by the stories told by their grandfather about the war, about the battles and campaigns in which he had taken part. Their grandfather had fought the enemies of Soviet rule during the Civil War, and in the Great

Patriotic War he had served in regimental reconnaissance, mounting bold forays behind enemy lines. He had begun the war as an enlisted man and ended it as an officer, commander of a battery of self-propelled guns.

Of course the brothers also had other interests at that time: sports, movies, books.... Later they developed another one -- model airplane building. In his off-duty leisure time, their father was glad to help them build aircraft models. Finally the time came when they began talking not about model airplanes but about real, combat aircraft.

The first to respond to the call of the skies was Yuriy, the older brother. He became an officer candidate at the Order of Lenin Yeysk Higher Military Aviation School for Pilots imeni Twice Hero of the Soviet Union Pilot-Cosmonaut USSR V. M. Komarov. That same school at which Anatoliy Pavlovich Roslyakov had also begun his aviation career.

From the very first days of training Yuriy decided that since he was going to be a pilot, he had to be a pilot like his father -- an expert at his job. He proceeded with persistence toward his stated goal. He studied hard and diligently. He was one of the first among his fellow cadets to go up. Yuriy still remembers that flight.

"Of course I did a lot of things wrong," he recalls. "When we landed, I was too embarrassed to look my instructor in the eye."

But Capt V. Lavrik did not seem to notice this.

"Not bad for the first time, Roslyakov."

"You are joking, comrade captain!" Yuriy sighed.

The instructor smiled: "There is a bit of truth in every joke, isn't there? But seriously, I think you will do all right."

This was indeed the case. Captain Lavrik, his other teachers and instructors painstakingly taught the young aviator, passing on to him their knowledge and experience, helping him develop flying skills. Each time up the pilot cadet performed more difficult assignments. The aircraft was becoming increasingly compliant, and Yuriy was deriving increasing pleasure from the training flights.

Roslyakov himself acknowledged that his cadet years were for him and many of his fellows a time of final determination of the correctness of their chosen career path. But the major tests still lay ahead.

Takeoff

Lieutenant Roslyakov reported to his assigned unit and began his line-service career with the firm intention of becoming a thoroughly trained combat pilot as quickly as possible. He also felt obligated to accomplish this because he happened to be assigned to the same aviation regiment in which his father had once served.

Considerable attention was devoted in the regiment to the period of familiarization and breaking-in of young pilots. Commanders and political workers not only taught them the skills of flying and combat employment in various conditions, day and night, but also instilled excellent moral and ethical qualities in them, as well as pride in their profession. Roslyakov was one of the first successfully to accomplish all flight maneuver sequences. His persistent, purposeful character and personality and, of course, assistance from his commanders and older comrades were contributing factors.

"I owe a great deal to Vladimir Vasilyevich Antyufeyev, my former flight commander and currently squadron commander," recalled Yuriy Anatolyevich. "We novice pilots learned from him the technique of flying a combat aircraft and the skill of scoring hits on ground targets on the first pass with all types of air-to-ground weapons."

Roslyakov worked hard, advancing persistently toward the stated goal. He soon became a first-class combat pilot and a flight commander. He taught his men, and he himself studied constantly, especially during the period of mastering a new aircraft. This aircraft, comprising a complex aircraft system, required of the pilots vast knowledge, solid skills, and firm moral-psychological conditioning. In the course of retraining on the new aircraft, officer Roslyakov and his men acquired greater confidence and combat skill from one flight to the next.

A certain tactical air exercise was an important test for them. The pilots were assigned the mission of penetrating the "aggressor's" air defense zone and delivering a strike on small targets. The flight's pilots performed skillfully. Flying at low altitude, they penetrated the "aggressor's" heavily defended zone and scored accurate hits on the targets. The mission was accomplished with a mark of excellent.

Yuriy amassed experience as a commander-indoctrinator together with growth in his professional skills. At first it was difficult, since every man in the flight had a different character and personality. It was necessary to take a close look at each man, to talk to each, to determine his moral-political and professional qualities, plus a good deal else. In this task as well Roslyakov was greatly assisted, especially at first, by the squadron commander, his deputy commander for political affairs, and party activists. They gave advice on where he should focus his attention and how he should proceed in a given instance. Yuriy paid close heed to their recommendations and organized his entire indoctrination activities in conformity with them.

He had to do a good deal of work, for example, with Sr Lt Yu. Kukharuk, a fair pilot in general, but who somewhat overestimated his own ability and thought he was infallible. The flight commander spoke with him repeatedly, reminded him about modesty, called him strictly to account for the slightest error of omission, endeavored to give him the frequent assignment to share his know-how with his comrades, and worked to develop collectivist traits in his character. In time Kukharuk changed for the better.

There are many such examples of a thoughtful, individualized approach to the men in Roslyakov's work experience. And each such incident enriched him with invaluable commander-indoctrinator work experience. All this of course could not help but affect results in flight, weapon and tactical training of the flight's pilots. They improved appreciably. The collective maintained the rating of excellent over a long period of time.

Officer Roslyakov gained a solid reputation in the regiment as a well-trained pilot, a skillful, knowledgeable commander, capable of performing with boldness and confidence in the air. Such an appraisal did not cause this officer to relax his efforts, however. Together with his flying comrades, he worked with even greater persistence and tenacity to hone his flying skills, preparing himself for possible future severe tests. And such a day arrived.

It happened when the young Roslyakov family was awaiting any day the arrival of their firstborn. Arriving home from work one day, Yuriy informed his wife: "I have to go away on TDY...."

"For how long?" she asked, concerned.

"I can't say right now. But don't worry, Marina. You won't be alone; our friends will help you."

The training did not take long. Soon Yuriy left for a new duty assignment in Afghanistan.

Maturity

Life at the airfield followed the normal routine; one training sortie followed another. And it went on like this day after day. In the course of intensive combat training, officer Roslyakov was perfecting his flying skills, toughening his volition and character, and developing qualities essential to the aviation commander.

At a certain tactical air exercise the pilots were assigned the mission to destroy "aggressor" weapon positions sited in mountaintop permanent-type emplacements. The squadron commander selected pilots Yu. Roslyakov, G. Garus, V. Sidorov, and V. Bondarenko. They already had experience in flying such missions.

They were not entirely successful in neutralizing the spotted antiaircraft weapons with missiles and cannon fire. They would have to bomb. This required both a high degree of piloting skill and precise bombing calculation. But the commanding officer had been correct in assigning such a difficult mission precisely to these pilots. Maneuvering with consummate skill, they released their bombs and scored accurate hits on the small targets.

Time and again the skies over Afghanistan put Yuriy and his comrades to the test of strength of character and pilot maturity. They got into some highly difficult situations and were exposed to danger. But internationalist duty and the awareness that the Afghan people were in need of friendly assistance gave them added strength and firmness of spirit. Officers Yu. Roslyakov, G.

Garus, V. Sidorov, and V. Bondarenko were awarded the Order of the Red Star for successful accomplishment of the task of rendering internationalist assistance to the Democratic Republic of Afghanistan as well as for courage and heroism displayed thereby.

Yu. Roslyakov's tour of duty as a member of the limited contingent of Soviet forces in Afghanistan became a bright page in his biography. A new page is now being written and, as his present superiors note, is being written no less brilliantly. Communist Roslyakov has been elected secretary of the squadron party organization. Naturally he has more work to do now, but whatever Yuriy Anatolyevich sets out to do, he does it with inspiration and enthusiasm. And people are drawn to him and pay close heed to his words. They know that Roslyakov does not like to talk a great deal, but when he does talk it is meaningful.

The following incident took place in the squadron. Once aircraft technician party member V. Azarov shared a concern with the party organization secretary: some of the aviation engineer service maintenance specialists were having trouble getting along with Capt G. Gedyma. Yuriy Anatolyevich, after thoroughly studying the state of affairs in the subunit, reached the conclusion that officer Gedyma was making mistakes in indoctrination work. They were also affecting his relations with his colleagues. The secretary shared his conclusions with the squadron commander and his deputy commanders. "I consider it advisable to transfer party member Gedyma to a different job area," he concluded.

The command authorities supported his suggestion, and results were soon in evidence. Soon relations in the collective improved. Quality of aircraft servicing and maintenance also improved. Captain Gedyma also did a good job in his new work assignment.

Roslyakov is presently a major and squadron deputy commander. The senior-level commander made the following comment in nominating him for the position: "He is purposeful, hard-working, and loves to fly...." Yes, these qualities have become fundamental in the character of this combat pilot. Years passed. The dream of flying became reality, but complacency, complete satisfaction with what has already been achieved, have not come. Yuriy Anatolyevich still keenly feels the call of the heights, the call of the heavens.

"I love my profession," he said in parting. And he added: "For us Roslyakovs, the sky is home, as the song goes. My father flew, and I followed in his footsteps. My younger brother has become a fighter pilot. And now I have a growing son. Who knows, maybe in time he also will fly.... I wonder what kind of aircraft they will be flying then."

How good it is when sons follow in the footsteps of their fathers! Today the young Roslyakov flying dynasty has taken its place in the winged ranks of defenders of the homeland.

3024
CSO: 9144/642

NAVAL AVIATION VTOL UNIT COMMANDER DISPLAYS STRONG MORAL FIBER

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 14-15

[Article, published under the heading "Visiting Our Comrades in Arms," by Candidate of Philosophical Sciences Lt Col N. Stolyarov: "By Strength of Moral Fiber"]

[Text] I met Hero of the Soviet Union Col Yu. Churilov at a Marxist-Leninist philosophy exam at the Air Force Academy imeni Yu. A. Gagarin, where he is enrolled as a correspondence student. This bold naval aviator, a man of initiative, had been written about time and again in the central newspapers, and therefore I already knew something about him. And when this officer proceeded to answer the examination question, he displayed increasingly more clearly traits which meet the highest demands placed on today's commander-indoctrinator.

On what is the strong authority of today's aviation commander, the strength of his influence on subordinates grounded? We talked about this after the examination. Yuriy Ivanovich thought for a moment, and then, proceeding without haste, weighing every word, proceeded to discuss the qualities a genuine commander should possess. Among other qualities he named moral fiber and communist conviction.

"A commander as an individual cannot exist without this," he stated with firmness.

I peered into his open, kindly face and thought to myself that for such a category of individual as a commander, moral fiber is not an abstract concept. Standing behind it is a cause which he is serving with dedication.

Quite frankly, Yuriy Ivanovich's job has been unusual and very difficult. He was one of the first pilots to learn to fly the VTOL aircraft. He fully mastered the skill of flying this complex aircraft, and subsequently taught this skill to other pilots. Serving as a regimental deputy commander, and subsequently a regimental commander as well, Colonel Churilov, so to speak, carried on his own shoulders almost all pilots from the "dime," that is, from the small deck of a ship which does not stand still and is almost never in a

calm state. It is a much more difficult task to take off from and land on a ship.

What is it that helps Yuriy Ivanovich cope successfully with this highly responsible task -- breaking in the flight personnel of the regiment of an ASW cruiser? I believe it is first and foremost a strong sense of personal responsibility and a profound awareness of duty to the homeland.

The meaning and significance of his activities, of his entire life lie in accomplishing the tasks connected with increasing the regiment's combat readiness, and consequently strengthening the defense might of the homeland.

They say that the foundation of a person's character is laid down in early childhood and that one's subsequent direction in life depends on his environment. In this respect as well, as Yuriy Ivanovich asserts, he was lucky. He always had experienced mentors. Of course his first example was his combat-veteran father. His many years of labor in the post of party committee secretary and subsequently kolkhoz chairman, and the experience of other party members more and more strongly convinced the young lad with time that the force of influence on people consists first and foremost in dedication to the common cause and personal exemplariness on the part of the person doing the leading. In seeking to grasp an understanding of the complex interweavings of life, he looked for a point to apply his own inner energies, his place among other people. The process of formation of the young man's world view began at that time. And nevertheless, in spite of the good grounding received in his youth, this was a long process. A characteristic mechanism is evident here. Communist ideals are not elaborated automatically. The road to such ideals passes through intense, purposeful labor, profound study of the works of the founders of Marxism-Leninism, guideline party documents, and acquisition of life experience. And party member Churilov is constantly raising his own level of professional skill.

"In order to lead others," he says, "it is not enough merely to be well-acquainted with Marxist-Leninist theory and party documents. One must also possess good job proficiency. I am absolutely convinced that a high degree of professionalism is a mirror which reflects a person's ideological maturity and communist conviction."

These are not merely pretty words. They are grounded on the life and flying experience of a regimental commander. During his years of service in naval aviation, life had time and again put his ideological and professional maturity to the test. Once, for example, Churilov was on a landing approach after completing a routine flight. At first everything proceeded normally. Straight ahead the pilot could clearly see the landing area with its guiding markings. As he worked the throttles as the approach progressed, the aircraft suddenly began responding poorly to the controls. The aircraft began settling. Quite frankly, the situation was critical. In these conditions the pilot could have ejected, and nobody would have blamed him. But the commander continued his approach, struggling to save the costly aircraft. And he succeeded.

Did the regimental commander have to take a risk at that moment? Was his risk warranted? The answer is unequivocal: Yuriy Ivanovich acted as his conscience, his flying and command duty dictated, for the situation was quite unusual. This meant that it was necessary to find out what the problem was, so that none of his men would end up in the same situation. Indeed, the aviation engineer service maintenance specialists took appropriate measures and did everything necessary to avoid similar incidents in the future. Consequently the commander had acted correctly, and this revealed particularly forcefully the fusion of his genuine communist moral fiber and a high degree of flying professionalism. And I believe I am correct in stating that precisely these qualities constitute that foundation on which Col Yu. Churilov's achieved successes and commander reputation are grounded.

The regimental commander is always smart in appearance, conscientious, polite and courteous. He has the ability to buck up his men with a witty remark at the appropriate time and to boost their spirits with a kind word. Well aware of the fact that personal example is a powerful pedagogic factor, the commander constantly monitors his own conduct and demands the same of his men. Once, for example, the subject of discipline was brought up at a work meeting. Some of the officers complained that certain of their subordinates at times displayed a lack of discipline and did not properly respond to adverse comment. Yuriy Ivanovich listened carefully to them, and then advised them, before holding others accountable, to ask themselves whether they had done everything to ensure that people understood what was expected of them and whether success in fulfilling the demands imposed on them was ensured. He demonstrated on the spot with specific examples that those subunits the commanders of which violate regulations and fail to serve as an example to others as a rule are not distinguished by a high degree of discipline and organization.

Is this mere happenstance? It is not. Every commander, regardless of rank and status, is a principal moral, ethical, ideological, and professional point of reference. He is always in the field of view of his subordinates, and dozens of eyes closely follow his every decision and action. This means that no matter how much one may talk about decency, conscientiousness, and moral fiber, there will be little use from it if the commander himself does not set an example.

In conditions of scientific and technological advance, the commander should possess diversified knowledge and solid skills which have a specific directional thrust and a party-minded foundation. This enables one more deeply to grasp the meaning and social significance of military labor, to see trends in societal development and military affairs, correctly to obtain one's bearings in the flow of contemporary events, and actively to assist our society's advance along the path toward communism, about which the finest minds of mankind have dreamed as an ideal.

In party guideline documents the regimental commander found a direct link between the ideal and actual, between knowledge, ideological conviction, goal, and purposeful activity. Knowledge, conviction, action. These are not only three points through which the line of conduct passes. Everything is interlinked here. Knowledge helps determine goal and raises political and

social activeness, while firm ideological principles and convictions are reinforced by the ability to implement them in one's daily work. In other words, a solid fusion of knowledge, convictions, and practical actions reflects the ideological conviction of commanders. Everything is important here.

Colonel Churilov compared this with a chain, which is determined by the reliability of each link. A commander's knowledge without conviction, just as convictions without the ability to carry them out, is a hollow abstraction. An officer's ideological conviction defines the goal, the general directional thrust of behavior, constitutes a motive in the work of the military leader and gives it consistency and an innovative character.

Yuriy Ivanovich is convinced that an officer who possesses communist consciousness will never make a deal with his conscience, will not exceed his authority, and will not take advantage of his office for personal advantage. He will not be guilty of unimaginative routine or excessive situation simplification in matters of combat training and will not send off for training or promote an unworthy officer in order to get rid of him. The attitudes of an outside observer are alien to him, as is a crassly materialistic attitude toward life. Such a leader-officer is capable of critically evaluating and overcoming everything which is stagnant and obsolete and of developing in himself and his subordinates a feeling of the new, socialist enterprisingness, and an innovative attitude toward his work.

But ideological narrowness on the part of a commander is as a rule linked with conservative, undeveloped thinking, gravitating toward the old, the established, the habitual. In today's combat or in an emergency situation such thinking can be simply paralyzed by heavy moral-psychological stress loads.

Take the following incident. A young pilot was unable to master the takeoff and landing. These are the most difficult phases of a flight for an embarked aircraft. Particular skill is essential here. The pilot tried very hard, but he was getting nowhere. He began losing all hope that he would be able to master this type of aircraft. At a regimental methods council meeting somebody suggested that he be washed out of the pilot training program. The commanding officer had the final word. Colonel Churilov went up with the pilot in a two-seater and could see that he loved his job and had flying ability. What was needed was to determine the cause of his failures. It became clear after several dual flights that the problem lay with an incorrect method of teaching him. The young aviator had previously flown an aircraft of a different type, and he was attempting to apply his acquired skills in new conditions. His instructors would frequently change, and naturally any goal-directed teaching process was out of the question, for each instructor had his own methods and techniques of imparting knowledge and skills, his own manner of flying, and the trainee was simply unable to absorb all this during the period of dual instruction.

"You'll make it," the regimental commander assured the pilot. "But you will have to work."

Inspired with new hope, the young officer set about the job of mastering the flight training program with redoubled energy. After some time the pilot mastered the aircraft and its combat employment in excellent fashion, and now is considered in the regiment to be a very promising combat pilot.

This example indicates once again that a commander's conviction gives his subordinate moral steadfastness, confidence in himself, and boosts his spirit. And the commanding officer did everything to ensure that the pilot became a full-fledged defender of his homeland and a genuine combat pilot.

Communist conviction helps Colonel Churilov not only correctly assess any event or situation, to take a correct position in a given instance, to be able to argue in a well-reasoned manner and defend it, but also to give a rebuff to those in whom convictions, as V. I. Lenin put it, lie no deeper than the tip of one's tongue.

"We military men must determinedly combat any and all manifestations of lack of moral fiber, passivity, excessive attention to form with consequent detriment to content, and dogmatism," states Colonel Churilov. "This is a real necessity, for our adversaries are not asleep at the switch; they are acting with sophistication, calculation, and cunning."

In the area of ideological-political indoctrination of military aviators, he wages a persistent, daily campaign for the individual, for his consciousness and professional military growth. His strong moral fiber, love for his job, purposefulness, and knowledge, embodied in practical deeds, become a tangible material force. Political maturity and a high degree of professionalism determine a conscientious attitude on the part of the military aviators toward military labor and give their job-related activities a moral-ethical and sociopolitical directional thrust.

This is vividly manifested in socialist competition to honor the 27th CPSU Congress in a worthy manner, in the search for new ways and means of effective mastering of combat equipment and weapons, strengthening discipline and organization, and increasing the political consciousness and moral-ethical level of naval aviators. The end goal of all combat and political training is a high level of subunit and unit combat readiness. Hero of the Soviet Union Col Yu. Churilov is directing his knowledge, experience, and the entire force of communist moral fiber toward its attainment, toward instilling in personnel total devotion to the cause of communism, love for the Soviet homeland, and hatred toward its enemies.

3024
CSO: 9144/642

INDIVIDUAL APPROACH TO EACH STUDENT PILOT URGED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 22-23

[Article, published under the heading "Military Educational Institution Affairs," by Military Instructor Pilot 1st Class Capt V. Sytyanov, squadron deputy commander for political affairs: "Taking Individual Qualities Into Account"]

[Text] Summer is a critical time for flight school pilot cadets. The young aviators begin working on their flying technique solo, flying in the pattern and in the practice area. Precisely during this period their moral-political and psychological preparedness plays a particularly important role in their overall readiness for flight activities. Unfortunately not everybody who is connected with training and indoctrinating student pilots always remembers this fact.

No matter how well a student pilot flies during dual instruction and on check flights, he reinforces his skills when flying solo. At our school preparation of a student pilot to solo is viewed as an integral, systemic process, which culminates theoretical, preliminary, and preflight training. Moral-political and psychological conditioning of future pilots takes on special significance in connection with this, as it is an important means of overcoming those inner difficulties which an instructor pilot and student pilot encounter just prior to solo flight.

A high degree of moral-political preparedness on the part of a student pilot, and persistence in working to attain his dream -- to become a military pilot -- enables one to overcome the psychological obstacles which one encounters during flight training, and for this reason they are of determining significance in psychological preparation. Such qualities as patriotism and class hatred toward the enemies of the homeland, internationalism, a feeling of duty and comradeship, and a striving to overcome any and all difficulties are instilled in pilot cadets by all forms, methods, and means of party-political work and are manifested in their daily activities, in training, flying, and in off-duty activities. When young people are deeply aware of their purpose, this increases their inner readiness to rise up in defense of the homeland, peace and progress at any time.

As the folk saying goes, he who figures in terms of years sows grasses; he who figures in terms of decades plants trees; he who figures in terms of centuries educates people. Our squadron's flight instructors, engineer and technical personnel well understand the fact that man stands behind the flight training plan and that our main task is to form and shape a harmoniously developed, ideologically convinced and energetic warrior. Each month the squadron party buro schedules and receives reports by leader-Communists on their personal contribution to the ideological-political indoctrination of pilot cadets and their responsibility for it. Considerable attention is devoted to the role of the party organizations of the flights. Recently, for example, the party members of the flight in which instructor pilot officer A. Filimonov serves as secretary discussed in a meeting the question of an individual approach to ideological-political indoctrination of pilot cadets.

Publicity of fine combat traditions exerts enormous mobilizing effect on the pilot cadets. Linkage between the heroic deeds of squadron personnel during the Great Patriotic War and pilot cadet achievements in flight training on jet aircraft give the young people stronger desire to perform flight assignments with excellent quality. For example, a conversation with former squadron commander Hero of the Soviet Union D. Barchenkov made a deep impression on pilot cadet S. Zakharov. He gained an understanding and profound awareness of what one must prepare oneself for, that it is necessary to apply all one's efforts to master the flying profession. This had a positive effect on his training.

Since the moral-political training of pilot cadets has a theoretical and a practical aspect, our instructor pilots, party and Komsomol activists endeavor in their work to ensure that each person takes part in subunit volunteer and political activities and that each individual has a regular party or Komsomol assignment. Our pilot cadets take part in putting out news bulletin leaflets, news sheets, photo newspapers, photo newsletters, hold talks on flight safety, and prepare radio newspapers on flight operations day tasks and performance results.

Formation and development of essential political and professional qualities takes place chiefly on the ground. For this reason all of our indoctrinators accept the thought that success in the air is forged out on the ground as a program for daily specific, purposeful work with the students, which always exerts certain influence on a person, on one's moral-psychological stability. For example, preparation of a student pilot to solo commences in the process of dual-flight training. The instructor pilot teaches the student the correct technique of performing flight procedures and ensures that the quality of their mastery is at a level ensuring flight safety. At the same time the student pilot prepares for solo flight in a moral-psychological respect as well. This is a very important item and has a practical directional thrust.

In our opinion the main thing here is to instill in the young pilot a sense of confidence, grounded on genuine preparedness to fly. It is precisely for this reason that matters pertaining to preparation to solo, determination of student pilot readiness, and organization of the training flight are discussed in great detail at methods classes in this squadron.

Exchange of advanced know-how occupies an important place. At one meeting, for example, flight commander Capt I. Popkov related how the flight's instructor pilots explain to the pilot cadets that, with desire and persistence, each of them can successfully master the flying profession, how they encourage initiative and independence on the part of the future pilots in performance of flight assignments, and demonstrate in the air possible errors and the proper ways to correct them. When pointing out mistakes, they demand that those be corrected which the student pilot himself is capable of handling on the next training flight. During the dual-flight training program it is very important not to exaggerate difficulties but on the contrary to explain and give an opportunity to the student pilot to become convinced of the aircraft's stability and controllability. And of course it is very important to prepare well those student pilots in the flight who will be the first to solo.

Instructor pilot Lt Ye. Kovalevskiy presented the thought that just prior to approving a student pilot for a check flight, the instructor pilot should stop prompting the student over the aircraft intercom, should give fewer instructions relating to his mistakes, should give him more independence in correcting his mistakes, and should increase his demandingness on the quality of execution of each maneuver.

Experience convinces us that, by constantly studying aspects of moral-political and psychological preparation, by discussing ways to improve the learning process, instructor pilots approach the professional training of future combat pilots in a firmer and stricter manner. Every word uttered and every action by an instructor pilot should be kindly and directed toward helping the pilot cadet successfully solo.

As we know, the instructor pilot's conduct exerts considerable influence on the psychological state of student pilots. Sometimes young instructors display excessive concern and nervousness when they allow student pilots to take their first solo flight. This can happen due to a lack of requisite self-control or a lack of sufficient confidence in their subordinates. This usually happens when a student is unsatisfactorily prepared to solo, when an instructor's group is lagging behind the others, and an instructor is hastening to solo his student pilot. Pilot cadet A. Klyuyev, for example, made a bad landing on his first solo. He later admitted that right up to the solo flight he always expected the instructor pilot to grab the controls during landing. This attests to the fact that a healthy psychological climate had not been established in the group. In any case the instructor should always conduct himself in a natural manner, calm and confident, giving his students no reason to doubt or lack confidence in their ability.

In our squadron a normal, businesslike atmosphere prevails as the students are about to solo. Experience indicates that making a big ceremony out of soloing or a lot of instructions pertaining to mistakes made on the last dual flights fail to produce a positive effect in instilling confidence about successful accomplishment of a student's first solo flight.

In readying student pilots to solo it is very important to determine and take into account the student pilots' individual psychological features. In the

process of instruction the instructor pilot, taking a student pilot's individual peculiarities into account, predicts his possible successes and failures, specifies in advance measures to prevent complications, and chooses the most effective methods of instruction taking into account the strong and weak points of the individual student.

Such methods as observation, discussion, and various experiments are employed in the squadron for this purpose. But special emphasis is placed on the so-called method of synthesis of independent assessments. Information on the individual characteristics of pilot cadets are gathered from persons in authority who are involved in some way with the pilot cadets' training and indoctrination. Analysis of this information results in preparation of a more or less objective profile of a young man, which also makes it possible to predict his flying ability.

This approach enabled us to determine in a comparatively short time during the dual-instruction program those student pilots who were unable to master a jet aircraft. And this is very important, for in spite of the fact that all students are different from one another as individuals, the pilot profession places identical demands on the qualities, knowledge, skills and ability of each pilot cadet. In conformity with this, the instructor pilot should know the young men's talents, abilities, proclivities and attitude toward flying, in order to foresee their successes and possible difficulties at any stage of flight training and to have the capability promptly to prevent the occurrence of mistakes, employing appropriate techniques and methods of preparing a student to solo. Aware, for example, of the fact that prior to enrollment pilot cadet Doronin had engaged in Greco-Roman wrestling, the instructor pilot was prepared for the young man to be slow in his movements on the controls. This assumption was confirmed during the first dual flights: the student pilot acted in a constrained manner in the air and gripped the controls too tightly, especially on landing. The instructor found a suitable device to make the student relax and to teach him to handle the controls properly.

Thus practical experience suggests that study of an individual's moral-psychological characteristics is an effective means of improving the quality of flight-training future combat pilots.

Of course success in flight training and organization of squadron personnel's off-duty and on-duty activities depend first and foremost on the commander, his work style, experience, flying and methods skill. But it is quite obvious that this success is simply inconceivable without developing in aviation personnel excellent moral-political and psychological qualities. Party and Komsomol activists give a great deal of assistance in this important matter to squadron commander Lt Col V. Onishchenko, to the flight commanders and instructor pilots. A healthy moral-psychological atmosphere is created in the subunit through joint efforts, nor could it be otherwise, for the combat

potential of any of our subunits constitutes a solid fusion of excellent technical equipment, military skill, and indomitable morale on the part of our servicemen.

3024
CSO: 9144/642

SUMMER FLIGHT TRAINING IN FULL SWING

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 24-25

[Article, published under the heading "Anticipating the 27th CPSU Congress": "Flight Operations Shift at the Airfield"]

[Text] Things are rarely quiet on the airfield during the good-weather days of summer: intensive, strenuous combat training is in progress, and the air trembles from the mighty roar of fighters taking off. Aviation personnel are carrying out their assigned missions with great spirit and enthusiasm. Their motto is to increase combat readiness with selfless military labor, to strengthen discipline, and to accomplish each and every flight assignment with excellent quality and without air mishaps.

Communists are marching in the vanguard of those competing to honor the 27th CPSU Congress in a worthy manner. They are setting the tone in flight training, displaying an example in mastering complex aircraft, and are waging a determined campaign against unnecessary situation simplification and unnecessary simplification of demands in training and indoctrination of military aviation personnel.

The best results in precongress competition were achieved by officers A. Yermolov and V. Mamonov (photograph, left) [not reproduced]. They have flown a great many training sorties which required of the aircrew excellent flying technique, smooth coordination, and a high degree of weapon proficiency. These officers performed with professionalism and knowledgeability in a complex air and tactical environment. These vanguard aviators have earned a high proficiency rating: Sr Lt A. Yermolov is a military pilot 1st class, and Sr Lt V. Mamonov is a military navigator 1st class.

Party member flight commander Military Pilot 1st Class Capt V. Sokol (photograph, center) [not reproduced] performs each flight assignment at the highest proficiency level. He always acts with initiative and determination in the air. This aviator also performed with distinction at a recent tactical air exercise, successfully intercepting an "aggressor" aircraft at the specified point. The young aviators emulate in their training this squadron party buro secretary.

The men of the aviation rear services have a lot of work during intensive flight operations. Logistic support of flight operations shifts depends on their skilled, smooth job performance. The men of officers V. Semenets and S. Khalayev (photograph, upper right) [not reproduced] successfully accomplish their assigned tasks. They maintain the airfield in a continuous state of combat readiness and efficiently operate the specialized vehicles and provide the aircraft with fuel, air, and nitrogen. Actively involved in pre-congress socialist competition, the men of this subunit are endeavoring to keep their word and to honor the 27th CPSU Congress with excellent results in military labor.

Fuel and lubricant specialists Capts N. Grachev and Yu. Nesvitayev carefully monitor fuel quality. The right center photograph [not reproduced] shows fuel testing in the lab.

Officer G. Borisenko skillfully organizes party-political work in the process of flight operations. He holds talks with aviation personnel, inquires about progress and quality of execution of flight assignments, and promptly synthesizes the know-how of the best pilots, engineers, and technicians. Party and Komsomol activists give considerable assistance to the political worker. In the lower right photograph [not reproduced] party member G. Borisenko converses with a group of Komsomol activists.

3024
CSO: 9144/642

PROGRAMMABLE-CALCULATOR ROUTE NAVIGATION COMPUTATION PROGRAM DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 26-27

[Article, published under the heading "Constant Attention to Flight Safety," by Military Navigator 1st Class Capt V. Shendrik: "Saving Time, We Increase Accuracy"]

[Text] A group of bombers was to fly to another airfield, and then at a designated time they were to knock out a target in an area specified by the director of the tactical air exercise. Redeployment was executed according to a plan drawn up in advance, but at the destination field the director changed the route from that point. Within the time remaining after landing at the redeployment field, the crews not only had to refuel, resupply and arm the aircraft, but also calculate initial data and feed the program into the navigation systems for the flight on the new route.

Everybody went to work without delay: the pilots obtained a detailed follow-up situation briefing and selected an optimal route and flight configuration to the target, while technician personnel readied the aircraft and navigators determined the requisite fuel load and prepared data for program input. Things were complicated by the fact that they did not have a special chart with a grid of great-circle coordinates, and therefore both the initial setting and verification data had to be calculated with spherical trigonometry formulas.

The aircraft took off on schedule, but the aircrews failed to follow their route precisely. In addition, upon returning to the airfield the group's aircraft came dangerously close to one another. They only avoided an air mishap thanks to the prompt and skilled actions of the tower controller.

In analyzing the near-mishap situation which had occurred, it was ascertained that an error had been made in the ground computations, due to which the specialist personnel had fed a faulty program into the navigation systems. Weather conditions made visual reference difficult, and some crews, fully trusting the automatic system, deviated from the specified route. After the flight the navigators blamed the fact that they had been strapped for time as well as the complexity of mathematical operations, but this was no excuse for the serious errors. They failed to hit the practice target.

As we know, determination of program input data is a responsible and painstaking task. Shortening the time required to accomplish this process enables one to prepare faster to carry out an assigned mission. As we see, however, haste leads to mistakes, which affect navigational accuracy.

In programming the route into the RSBN-6s, a specially prepared chart with a great-circle coordinate grid is needed to determine input and verification data. If such a chart is not available, the coordinates are calculated using spherical trigonometry formulas. The entire process requires considerable time in both cases.

To increase the accuracy of the data fed into the RSBN-6s system, I suggest the following program for computing them on the Elektronika BZ-34 hand calculator. Only 7 minutes are required to enter data and check it with a verification test, while 8 minutes are required to calculate input data for six programmed points. Elektronika BZ-34 hand calculators are available in practically all aviation units. I feel that this program will assist navigators in performing calculations. I shall present a point-by-point sequence for easier memorization of the sequence of procedures with the hand calculator.

1. Switch on calculator (MK).

2. Put MK in programming mode by pressing keys F and PRG.

3. Enter the following program.

One must remember that the program consists of six interlinked parts: first address 00-08 (program to convert geodetic coordinates, expressed in degrees, minutes and seconds, into degrees); second -- 09-20 (program for calculating coordinate Yinp); third -- 21-39 (program for calculating coordinate Xinp); fourth -- 40-48 (program for calculating convergence of meridians Delta); fifth -- 49-71 (program for calculating test heading psi-te); sixth -- 72-80 (program for putting a modified address G into register RG5 and calculating test range Dte).

4. Switch the MK to automatic mode by pressing keys F and AVT.

5. Enter the following constants into register memory: 180 -- P, 0; 111, 12 -- P, 6; 60 -- P, 7; 360 -- P, 9; 3,600 -- P, A; 5,000 -- P, D.

The calculator is now ready.

6. Enter test data: phi-0=42 deg 10'13"; lambda-0=40 deg 54'31"; phi-t=40 deg 38'58"; lambda-t=36 deg 19'43" in the following sequence: a -- enter degrees of latitude phi-0 (42); b -- press key "up arrow"; c -- enter minutes of latitude phi-0 (10); d -- press key "up arrow"; e -- enter seconds of latitude phi-0 (13); f -- press keys V/O and S/P.

Latitude phi-0, expressed in degrees, minutes, and seconds, is converted into degrees, and its value is stored in register RG1. Thus one must enter lambda-

0, phi-t, lambda-t. I shall add the reminder that failure to observe the proper sequence in entering coordinates will lead to a change in the sequence of their loading into memory registers and to incorrect calculations.

Адрес	Нажимаемые клавиши	Адрес	Нажимаемые клавиши	Адрес	Нажимаемые клавиши	Адрес	Нажимаемые клавиши
00.	«ИП» «А»	21.	«ИП» «3»	42.	«ИП» «8»	63.	«F» «X<0»
01.	«:»	22.	«ИП» «1»	43.	«X»	64.	«7» «0»
02.	«XУ»	23.	«—»	44.	«F» «X<0»	65.	«XУ»
03.	«ИП» «7»	24.	«И» «6»	45.	«4» «8»	66.	«ИП» «9»
04.	«:»	25.	«X»	46.	«ИП» «9»	67.	«+»
05.	«+»	26.	«ИП» «8»	47.	«+»	68.	«БП»
06.	«+»	27.	«2»	48.	«С/П»	69.	«7» «1»
07.	«К» «П» «5»	28.	«:»	49.	«ИП» «С»	70.	«XУ»
08.	«С/П»	29.	«F» «lg»	50.	«ИП» «В»	71.	«С/П»
09.	«ИП» «2»	30.	«ИП» «3»	51.	«:»	72.	«2»
10.	«—»	31.	«F» «sin»	52.	«F» «arctg»	73.	«П» «5»
11.	«П» «8»	32.	«ИП» «С»	53.	«ИП» «В»	74.	«ИП» «В»
12.	«ИП» «3»	33.	«X»	54.	«F» «X<0»	75.	«F» «X²»
13.	«F» «cos»	34.	«X»	55.	«6» «1»	76.	«ИП» «С»
14.	«ИП» «6»	35.	«+»	56.	«XУ»	77.	«F» «X²»
15.	«X»	36.	«П» «В»	57.	«ИП» «0»	78.	«+»
16.	«X»	37.	«ИП» «Д»	58.	«+»	79.	«F» «√»
17.	«П» «С»	38.	«+»	59.	«БП»	80.	«С/П»
18.	«ИП» «Д»	39.	«С/П»	60.	«71»		
19.	«+»	40.	«ИП» «3»	61.	«XУ»		
20.	«С/П»	41.	«F» «sin»	62.	«ИП» «С»		

Key: 1. Address; 2. Keys

---

7. By sequential pressing of key S/P we obtain: Yin=4637.9374; xin=5285.66; Delta -- 356.78133; psi=308.27272; D=461.1834. If the calculator produces the above values, the program has been correctly entered.

8. Pressing keys 0, P, 5, we load modified address 0 into the register.

9. The procedure of entering the coordinates of the point of origin of the great-circle coordinate system and the beacon of the second field is described in paragraph 6.

10. Calculate input and test data according to paragraph 7 for the beacon of the second airfield.

Calculations for the remaining beacon and waypoints are performed in the same manner. It is not necessary to enter modified address 0 and the coordinates of the point of origin of the great-circle coordinate system, since they are stored in the calculator's memory.

To calculate a route with origin of the great-circle coordinate system at another point, enter modified address 0 into register RG4 by pressing keys 0, P, 5. Then enter phi-0, lambda-0, phi-t, lambda-t, and perform the subsequent calculations.

I believe that if the navigators of the bomber flight discussed at the beginning of the article had been able to perform their computations with the suggested program, they would have had enough time not only to prepare the navigation systems but also for a thorough checking of the obtained data.

3024
CSO: 9144/642

BOMB DISPERSION STATISTICAL PROCESSING WITH PROGRAMMABLE CALCULATOR

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 26-27

[Article, published under the heading "Assisting the Navigator," by Candidate of Military Sciences Lt Col G. Dudin and Military Navigator 1st Class Maj V. Solovyev: "The Elektronika Calculates Faster"]

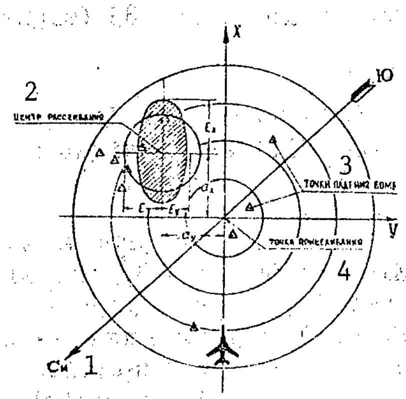
[Text] Hand calculators, especially the so-called programmable calculators, such as the Elektronika BZ-34, the Elektronika MK-54, the Elektronika MK-56, and the Iskra-124, are becoming increasingly more popular with specialist personnel in the military. They are called programmable because they are capable of loading and executing a program of computations. They are simply indispensable for solving a number of problems which are frequently encountered in the air navigator's daily practical activities.

The microcalculator is small, easy to operate, fast, highly accurate and, finally, just plain fun to use. Take, for example, statistical calculations. With the Elektronika BZ-34 one can estimate in detail and quickly the accuracy and grouping of dropping of paratroops, bombing (gunnery), their dependence on the level of crew proficiency, types of aiming devices and weapons and, most important, one can determine systematic errors and take prompt measures to correct them.

Manual data processing requires a great deal of time, and calculations and results are rounded off, due to which it is impossible correctly to evaluate crew performance.

Here is how one handles, for example, statistical processing of bombing data with the Elektronika BZ-34. Let us say that we have the results of 10 (n) bombing runs (R, m/A, degrees): 170/115, 120/80, 20/285, 140/80, 20/185, 160/75, 150/120, 150/340, 135/65, 130/70, with a bombing run course (K) of 140 degrees (see figure). To process this data, turn on the calculator and switch it to programming mode by pressing keys F and PRG. Then enter the statistical processing program, sequentially pressing the following keys:

шн: П1 Cx П4 ПА ПВ ПС ПД С/П П2 ИП1 — ПО Fcos ⇄ П3 × Fx^2 FBx ИПА + ПА ⇄ ИПС + ПС ИП3 ИПО Fsin × Fx^2 FBx ИПВ + ПВ ⇄ ИПД + ПД КИП4 ИП4 БП 07 ИПА ИП4 ÷ П5 С/П ИПВ ИП4 ÷ П6 С/П ИПС ИП5 Fx^2 ИП4 × — ИП4 1 — П9 ÷ F√ 0,6 7 5 ПО × П7 С/П ИПД ИП6 Fx^2 ИП4 × — ИП9 ÷ F√ ИПО × П8 С/П ИП7 × F √ П9 С/П.



Results of ten bombing runs and their statistical characteristics of dispersion.

Key: 1. North; 2. Mean point of impact; 3. Bomb impact points; 4. Point of aim

After this, the calculator is switched to automatic operation mode by pressing keys F and AVT. Toggle R=G is set to position G. The bombing run heading and bombing results are entered in the following sequence: -- 140 V/O S/P -- storing bombing run heading and clearing memory; -- 170 "up arrow" 115 S/P -- processing result of first bombing run; -- 120 "up arrow" 80 S/P -- processing result of second bombing run; -- ... "up arrow" ... S/P -- etc.

After completing processing of the current bombing result, its serial number appears on the display.

After completing entry and processing of bombing results, press keys BP and 42 to switch the calculator to computation of statistical characteristics of dispersion. Their values should be read after each successive S/P keystroke. For our example they are (see figure): a-x=42.88 m; a-y=-77.15 m; Ex=55.94 m; Ey=38.76 m; E=46.56 m.

These same values and certain other data can be obtained by reading the contents of the appropriate memory register. In the program it is distributed as follows: 1 -- K, 2 -- A, 3 -- R, 4 -- n, 5 -- a-x, 6 -- a-y, 7 -- Ex, 8 -- Ey, 9 -- E. For example, one can read value a-x following keystrokes IP and 5, while another target run course of 210 degrees is entered by sequential keystrokes 2, 1, 0, P, 1.

Of course statistical processing of the results of 10 bombing runs is merely an example containing methodological significance. In actual practice, however, one processes results of several dozen and hundreds of bombing runs. It is frequently necessary thereby to enter correlation of events. Nevertheless, if the data in the cited example are processed manually, plotting on millimeter graph paper, it would take at least half an hour. On the Elektronika the entire processing takes 6-7 minutes, with 3-4 minutes to enter the program. This means that with an increase in the number of bombing runs the savings from employing the programmable calculator will be even greater.

We have cited just one of a great many possible variations of utilization of the programmable calculator for navigator calculations. Of course the most difficult thing here, just as in any other area, is to take that first step into the unfamiliar and unknown. But if this step is taken, the programmable calculator will become a dependable and indispensable assistant.

3024
CSO: 9144/642

HELICOPTER LOSS OF CONTROL PROBLEM ANALYZED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 32-33

[Article, published under the heading "Constant Attention to Flight Safety," by Doctor of Technical Sciences Professor Col A. Volodko, USSR State Prize recipient: "Helicopter in 'Pickup' Mode"]

[Text] The crescendo roar of turbines broke the silence of early morning. Popping up from over the pass, a pair of helicopters streaked above the valley and turned onto their attack course heading. The crews were performing a scored exercise -- firing rockets at a ground target from a dive. They scored accurate hits.

It was hard to tear one's eyes from the blasted target, but the ground was approaching rapidly; it was time to break away. Having lingered slightly, the pilot of one of the helicopters vigorously pulled back on the stick. The helicopter obediently stopped its descent and proceeded to climb. This was accompanied, however, by an unusual shaking and light rocking of the helicopter from side to side. The pilot glanced at the G reading -- the pointer was holding at the 2 mark, while the artificial horizon sequentially showed pitch-up angles of 20, 30, and 40 degrees. The pilot pushed back the control stick to put the craft into level flight, but the helicopter failed to respond. He pushed the stick full travel, but to no avail.

"Skipper, we're down on the tail!" the worried voice of the copilot-weapons officer rang out over the intercom.

And there was reason for concern. Within the span of a few seconds the pitch angle had changed by more than 50 degrees, while airspeed had been cut almost in half. Most important, however, the helicopter was practically refusing to obey the controls. "Podkhvat!" [pickup] the thought suddenly flashed through the pilot's mind. He applied hard left foot pedal and eased off on the collective-pitch stick. The helicopter nose came down, the craft came over the top and into a dive attitude. The craft then resumed level flight.

Analysis of the flight data recorder tapes revealed errors: excessive airspeed, excessive rate of pitch angle change, as well as failure to monitor main rotor rpm during dive pull-out. The pilot claimed that the G-load was

not above normal, but an indirect indicator -- a diffuse collective-pitch analog-command track, caused by the helicopter's shaking -- attested to its considerable magnitude.

In the debriefing and analysis of this incident, the commander limited himself to general comments and warnings, but he repeatedly mentioned the term "podkhvat."

Some time later the mistake was repeated in that same unit. While on an afternoon training sortie, during the hottest time of the day, the pilot began to pull out of a dive and at this moment recorded 2.2 Gs. The helicopter proceeded to climb hard. In spite of the pilot's desperate efforts, the control stick would not budge. Recalling the incident involving his comrade, the officer gave hard left pedal and pushed the collective-pitch stick downward. The helicopter went over the top, began descending rapidly and picking up airspeed. The control stick "slackened," but he had to increase collective pitch, since rotor rpm had reached 120 percent. From this point the pilot manipulated the controls with precision, and the flight ended safely.

The term "podkhvat" applied to helicopters combines several abnormal phenomena. These include spontaneous pitchup, loss of longitudinal control effectiveness, and heaviness or even brief sticking of pitch control. Let us examine these items in greater detail.

The hinged rotor blades execute a periodic flapping motion, forming a moving cone of rotation, deflected (tilted) rearward and sideward. Due to its tilting, longitudinal force H forms on the hub, also directed rearward (Figure 1 on back cover) [not reproduced]. It forms pitch-up moment Mz-v=Hy-t, where y-t is the distance from the center of the hub to the center of gravity (vertical positioning of center of gravity), relative to the helicopter's center of mass.

Propulsive force Hc=TDchi, generated by forward deflection of the swash plate by angle chi and inclination in the direction of flight of thrust vector T (D -- control system kinematic transmission factor), imparts translational motion to the helicopter. Propulsive force forms on the positioning of center of gravity arm diving moment TDchi-y-t relative to the helicopter's center of mass, which to a considerable degree balances out the main rotor longitudinal force pitch-up moment.

The greater are airspeed V, main-rotor collective-pitch angle phi and angle of attack alpha, the greater are the blade flapping motion amplitude, thrust, longitudinal force, and moment on the hub. These relations (Figure 2, solid lines) change considerably when blade stall occurs and develops on the main rotor. The dashed lines in Figure 2 characterize conditions of separationless flow over the blades, while the hatched regions indicate quantitative change due to blade stall of the forces in question.

The main rotor is unstable in angle of attack. When angle of attack increases in the process of maneuvering, longitudinal force H increases, generating a destabilizing pitch-up moment relative to the helicopter's center of gravity.

This promotes an even greater increase in alpha. Angle-of-attack longitudinal stability is secured chiefly by a stabilizer, which with an increase in alpha generates diving moment Mz-st=Yst x-st.

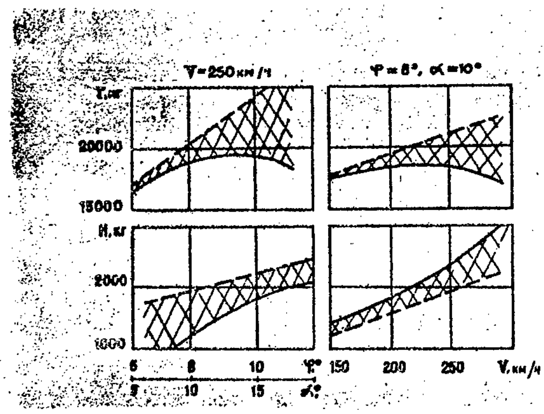


Figure 2. Relationship between thrust and main rotor longitudinal force on the one hand and helicopter maneuvering parameters on the other.

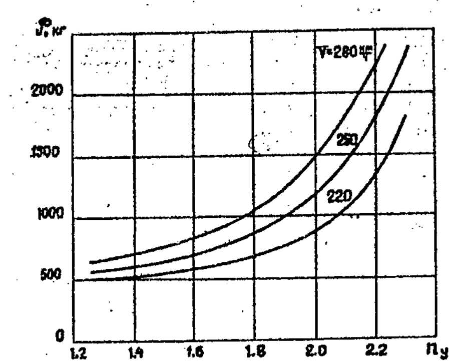


Figure 3. Relationship between force on the longitudinal control hydraulic actuator rod and helicopter maneuvering parameters.

In maneuvering with large values of V, phi, and alpha, when the angle of attack increases substantially upon entering a zoom-climb or pullout from a dive, the stabilizer diving moment does not equalize rotor pitch-up moment. The unstable helicopter enters conditions of spontaneous pitch-up, and "podkhvat" commences.

The influence of longitudinal control moment Mz-c=TDx-y-t is limited by the relatively small range of swash plate deflection (chi-max=8 degrees) and the maximum possible rotor thrust. It is evident from Figure 2 that with

supercritical blade stall across the main rotor, its thrust ceases to increase with increasing angle of attack -- "saturation" occurs, as it were.

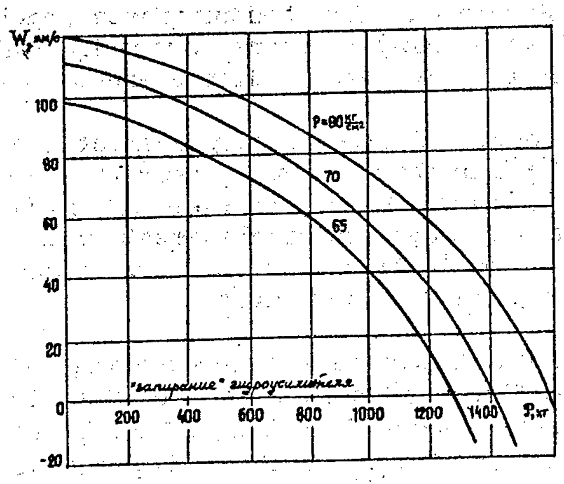


Figure 4. Hydraulic actuator loading characteristic curve.

Thus when a helicopter enters large supercritical alpha values, rotor pitch-up moment increases precipitously, while the controlling moment is limited. Therefore, if the pilot pushes the control stick forward at a moment when Mz-v is greater than Mz-c, this does not exert the needed effect on the helicopter. It spontaneously continues its nose-up attitude. This is a second manifestation of more advanced "podkhvat."

Conditions of flow across the rotor blades are fairly fully characterized by thrust T, which at a given helicopter flying weight G is unequivocally determined by normal G-load n-y=T/G. Consequently, in order to prevent intensive development of blade stall (the principal cause of "podkhvat"), it suffices to maintain during maneuvering the allowable G-load specified in the operating manual. One should bear in mind that the greater the flying weight and altitude, the greater the rotor collective pitch will be, and consequently the closer to stalling (or deeper in stall) the blades are, and the smaller the allowable G-load. In connection with this, allowable G-load is specified with a certain safety margin.

In addition, due to the asymmetry of the geometric blade profile, as well as variance of their axes of rigidity, centers of mass and pressures along the chord, so-called hinge moments are generated in flight, which twist the blades in relation to their longitudinal axes. These moments generate substantial forces on the rotor hub and swash plate, which affect the hydraulic actuator rods in the control system.

This is particularly noticeable during vigorous helicopter maneuvering (Figure 3). A sharp increase in rotor blade hinge moments and forces P in the control

system is caused by rotor blade stall at certain values and combinations of parameters V, phi, and alpha. Overcoming the force from the blade hinge moments, the hydraulic actuator rod deflects the control plate in the desired direction at rate W. It is determined by force P and working pressure p in the hydraulic system (Figure 4). The maximum force which a hydraulic actuator can overcome is equal to working pressure in the hydraulic system times area of the power rod piston at zero rate of displacement.

Thus the smaller the power rod rate of displacement, the greater the force it overcomes in the control system and the lower the working pressure in the hydraulic system. If maximum force proves equal to the force from the blade hinge moments, the rate of power rod displacement will be zero. The hydraulic actuator "shuts off" in application of force, as it were. This is the third, most dangerous manifestation of "podkhvat."

A maximum allowable load factor during maneuvering, which characterizes the calculated rotor blade flow conditions, is specified in order to exclude the possibility of hydraulic actuator "shutting off." It is usually less than the allowable value based on longitudinal stability and controllability safety margins. In its determination one takes into account flying weight, altitude and airspeed, and provides for appropriate safety margins for adverse change in ambient temperature and working pressure in the hydraulic system. The higher the temperature, the sooner blade hinge moment increase commences due to worsening of airflow conditions. The lower the pressure in the hydraulic system, the faster a hydraulic actuator "shuts off." Pressure decreases during vigorous manipulation of the helicopter controls involving several control axes. Thus vigorous deflection of the controls not only creates conditions for the occurrence of "podkhvat" but also impedes the helicopter from recovery from these conditions.

We shall analyze a specific segment of "podkhvat" during maneuvering (Figure 5 on the back cover) [not reproduced], supplementing the flight data recorder tape interpretation results (solid lines) with computer-calculated data on the most important unrecorded parameters (dashed lines). We shall adopt as origin t=0 a sustained helicopter dive in attacking a ground target, when the control plate is deflected forward by chi = approximately 4 degrees, pitch angle upsilon is approximately -10 degrees, angular rate of pitch omega-z = approximately 0, main rotor rpm n-r = approximately 95 percent, and airspeed in the dive trajectory V = approximately 280 km/h. Alpha = approximately upsilon, and n-y < 1.

At designated moment t=2.5 seconds, the pilot vigorously pulls back on the control stick, generating an angular rate of pitch rotation of approximately 15 degrees per second. The helicopter begins nosing up sharply, airspeed drops, while angle of attack, rotor rpm, and load factor increase rapidly. At t=5 seconds, when upsilon = approximately 20 degrees, alpha = approximately 10 degrees, n-y = approximately 2, one observes typical "trembling" of the track recording collective pitch phi, which attests to strong shaking of the helicopter fuselage.

Feeling the shaking, after the fourth second the pilot vigorously pushes the control stick forward, but pitch angle and load factor continue to rise. In

addition, excessive over-revving of the main rotor occurs. The control stick is pushed forward full travel, but again without effect. Only after the left foot pedal is depressed, collective pitch is reduced, and airspeed falls off significantly does stabilization of pitch angle and rotor rpm begin.

For almost 3 seconds the helicopter refused to obey the controls (t = approximately 4.5-7.5 seconds), continuing to pitch-up spontaneously. During this period of time airspeed dropped from 270 to 200 km/h, alpha reached 18 degrees, and collective pitch ran 8-10 degrees. Figure 2 graphically shows that with these combinations of parameters the main rotor is in supercritical conditions of advanced blade stall, which is the real cause of the "podkhvat."

Both aerodynamic and hydromechanical decrease in control effectiveness is of extremely short duration. As soon as forces from the hinge moments decrease, the designed rate of main rotor hydraulic actuator power rod operation is immediately restored, and the rotor controlling moment increases. When the hydraulic actuator is operating at the limit of its capabilities, the main thing is not to exceed this limit, not to allow brief jamming of control. One should strictly observe the specified restrictions, especially regarding load factor. The pilot must remember that in these conditions the control stick should not be "snatched," especially at high airspeed and altitude, helicopter flying weight, and high ambient temperature.

Angles of attack alpha, pitch theta and trajectory inclination in the longitudinal plane Theta are interlinked by the following relation: alpha is approximately = theta - Theta. Pitch angle changes with an abrupt control stick deflection, while angle Theta changes only after some time. Precisely for this reason alpha increases abruptly, causing blade stall. If the control stick is deflected smoothly and evenly, however, increase in theta will be countered by an increase in Theta, and correspondingly the rotor angle of attack will also change smoothly and evenly and, most important, to a lesser magnitude.

Pilots usually execute a left turn while in a zoom-climb to get out of "podkhvat," which causes some aerodynamic relieving of the tail and main rotors. But this must be done cautiously, without allowing the left foot pedal to depress full travel, or one must execute a coordinated right turn while zoom-climbing.

When the load factor drops to zero or rotor negative thrust is generated (full left foot pedal), the helicopter may enter spontaneous rotation. With forward speed, under the effect of rotor torque reaction, the helicopter may spontaneously turn its side or even tail to the direction of flight. This situation is more dangerous than "podkhvat," since the main rotor blades come too close to the tail boom.

When pulling out of a dive, in order to prevent "podkhvat" it is advisable to bring the helicopter level at an approximately zero pitch angle, after which the pilot should resume pulling back on the control stick. This will guarantee safe maneuver execution.

3024
CSO: 9144/642

SOVIETS BITTERLY CASTIGATE STRATEGIC DEFENSE INITIATIVE

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 36-37

[Article, published under the heading "Imperialism -- Enemy of Peoples," by Col M. Sergeyev: "Strategy of Space Blackmail"; based on materials published in the foreign press]

[Text] The aggressive plan to militarize space announced by U.S. President R. Reagan presents a serious danger to mankind. Its implementation will inevitably lead to an unchecked arms race in all areas, will make it impossible to limit, let alone reduce strategic offensive arms, and will sharply increase the threat of nuclear war.

The present administration, which has fallen prey to dangerous illusions, believes that an unchecked increase in military preparations, further escalation of the arms race and its extension into space is the "key" which will allegedly open up the path to success at Geneva and force the Russians to yield. This is the essence of Washington's strategy of space blackmail. The White House is attempting to call black white, to portray deadly plans to saturate space with the latest weaponry as a "road leading to peace and security." If one discards the husk of rhetoric, it all boils down to the following: having protected their missiles with a "space shield," the Washington strategists are planning on delivering a first strike from behind this shield, in the belief that this shield will repulse a response, retaliatory strike. Assertions about the "defensive" nature of such plans should not delude anybody. Upon gaining protection behind a "space shield," the United States intends to hold the entire world in fear and to dictate its will to other peoples.

"It does not take much imagination," stated Assistant Secretary of the Air Force E. Aldridge, "to see that a nation which controls space can control the world." General R. Marsh put it even more candidly: "We must achieve the capability to fight a war from the Earth's surface against targets in space, from objects in space against other objects in space, and from space against the Earth." U.S. Undersecretary of Defense F. Ikle stated before a Senate committee that the plan to prepare for "Star Wars" is not a "standby program" but a "central item of U.S. military planning." He stated that construction

of a "partial defensive system," with the mission of "protecting U.S. missiles," will begin in the 1990's.

Plans to build a "total" antimissile defense system are being devised in the United States in conformity with this sinister strategy. They prescribe the utilization of various kinds of ground, air, and space-based antimissile weapons, disposition in depth, and massive employment of targeted weapons.

According to the views of Pentagon strategists, a key role should be played by the "space echelon" of antimissile defense, which will be assigned the principal missions of destroying targets at several points. It is planned to destroy missiles in the powered flight phase, that is, practically over Soviet territory, in that trajectory segment where the warheads separate, as well as on the middle segment of the flight trajectory, beyond the atmosphere. A high degree of effectiveness is projected for this unique Maginot line in space, which would intercept 99 percent of launched warheads. They are counting most heavily on space strike systems based on new physical principles and the most advanced means of surveillance, target discrimination, tracking, and selection.

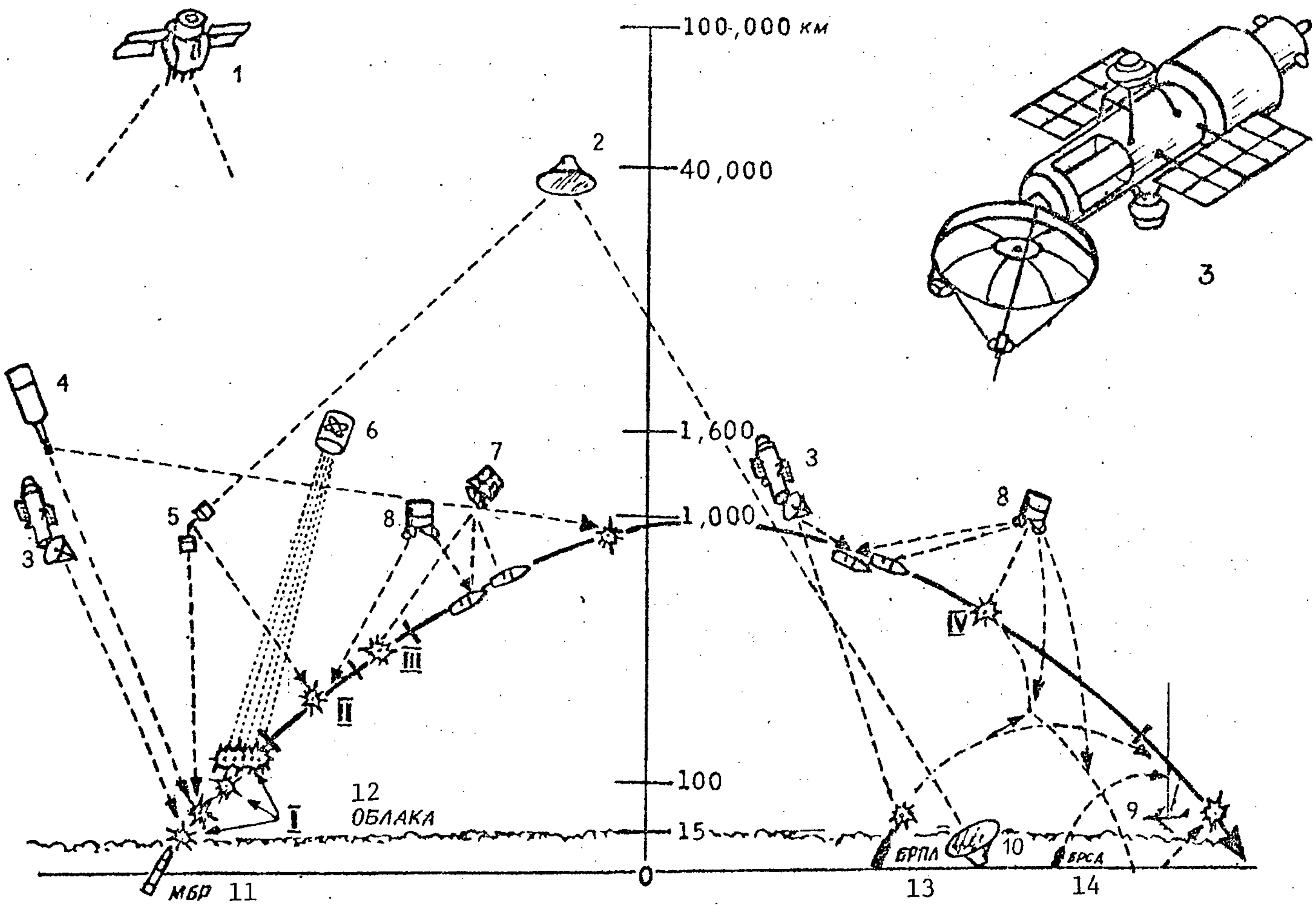
Judging from reports in the foreign press, the "space echelon" would be based on orbital combat stations at altitudes ranging from several hundred to several thousand kilometers (see figure). They would carry laser and beam weapons, electromagnetic cannons, missiles with conventional warheads, and orbital mirrors redirecting electromagnetic oscillations.

The Pentagon strategists and arms merchants of the military-industrial complex claim that 100 orbital combat stations will be sufficient to assure absolute interception of missiles in the powered flight phase and on the warhead separation segment of the trajectory. Each would be capable of knocking out from 50 to 100 targets with its directed-energy weapons.

At any given moment a force ranging from 15 to 30 percent of all combat stations should be positioned above the "adversary's" territory. The remainder (beyond detection range from the "adversary's" ICBM deployment areas) would be employed to intercept submarine-launched ballistic missiles and separated ICBM warheads.

The Pentagon intends to employ the reusable Space Shuttle craft to place the combat stations and redirecting mirrors into orbit. In addition, a new booster, designated HL, capable of carrying heavy payloads into space, is being developed under U.S. Air Force contract.

President Reagan's militant call for a space arms race rang out as glad tidings for the U.S. military-industrial complex. Leading scientific research centers engaged in the development of military hardware and arms manufacturers have stepped up the pace of research and development with the aim of producing experimental models of space components of the "antimissile shield" at the earliest possible date. It is reported in the press that the Livermore Radiation Laboratory is developing an X-ray laser with nuclear pumping. A series of nuclear explosions involved in the program to develop this type of weapon have already taken place at the Nevada underground nuclear test site.



Layout of an Echeloned Orbital Antimissile Defense System: I -- interception of ICBMs in the powered flight phase; II -- interception of MIRV stage and separated warheads; III-IV -- interception of warheads in the middle trajectory segment; 1 -- early warning satellites; 2 -- "mirror" in stationary orbit; 3 -- orbital station carrying chemical laser; 4 -- electromagnetic cannon; 5 -- "combat" mirrors; 6 -- orbital station with X-ray laser; 7 -- orbital station with accelerator weapon; 8 -- orbital platform with target discrimination, guidance and selection devices; 9 -- target designator aircraft; 10 -- ground-based laser combat station; 11 -- land-based ICBMs; 12 -- clouds; 13 -- submarine-launched ballistic missile; 14 -- medium-range ballistic missile

It has been reported in the foreign press that an orbital combat station carrying an X-ray laser will include a nuclear initiator charge, devices to form and shape beamed coherent X-ray emission (up to 50 "tubes" and more), as well as a system to detect targets and aim the lethal beams at them. Incidentally, we should note that the United States is carefully attempting to sidestep the fact that an X-ray laser is nothing other than a new kind of nuclear weapon, the very fact of launching of which into space will constitute a violation of the 1963 Treaty, which prohibits the detonation of any nuclear devices in space, and of the 1967 Treaty, which prohibits the deployment of nuclear weapons in space.

Accelerated efforts are also in progress to develop infrared-band chemical lasers. In contrast to X-ray lasers (which self-destruct as a result of detonation of the nuclear initiator charge), they can be used repeatedly. There are plans to test free-electron lasers emitting in high-frequency (ultraviolet and visible-light) regions of the electromagnetic spectrum. A system of mirrors positioned in different orbits and capable of reemitting energy at targets in space will be developed for this purpose.

The physicists at Los Alamos -- successors of the creators of the first atomic bombs -- are also hastening to make their contribution to the development of "Star Wars" hardware. They are working on development of space-deployed accelerator weapons. According to the calculations of these theorists, powerful beams of neutral particles, of hydrogen atoms, for example, produced by compact orbital-based accelerators, will be able to kill satellites, ballistic missiles and their warheads at ranges in excess of 1,000 kilometers. According to statements made by experts at the Los Alamos Laboratory, a prototype of such a weapon could be built within the next few years. By the beginning of the 1990's they will be able to reduce the accelerator they are developing under the auspices of the White Horse project to a size small enough to be carried into orbit. An on-board nuclear power generating unit can provide for the power needs of orbital stations carrying beam and other types of directed-energy weapons.

But how can a missile be destroyed in the middle segment of its flight trajectory? Scientists see a solution in the employment of an electromagnetic cannon based on an electrodynamic mass accelerator (EDMA). They believe that a space-based EDMA will be capable of destroying missiles and warheads, firing an average of one projectile per second. The first-generation space-based EDMA will weigh 25-150 tons. Arms manufacturers Westinghouse, Aerojet, and General Dynamics, it is reported in the Western press, have already signed contracts and have proceeded with design and building of electromagnetic cannons. It is also reported that an experimental EDMA has accelerated projectiles to a velocity of 4.2 km/s.

Proceeding in parallel with the development of space-based strike weapon systems, the United States has been pushing the pace of research in the area of technology of surveillance, target detection, discrimination, selection, aiming and guidance of orbital interceptors.

Infrared detectors for DSP early warning system satellites, sensors which are insensitive to the Earth's thermal radiation passing through the atmosphere,

highly-sensitive radiometric and spectrometric sensors, as well as optical-band detecting devices carried on board orbital platforms are considered to be the most promising.

The Pentagon plans to develop and orbit synthetic-aperture microwave radars and ultraviolet detection and ranging equipment to perform target tracking, discrimination and selection.

Nor have they forgotten such traditional modes of surveillance as forward basing of target detection, discrimination and selection devices carried on board aircraft patrolling along the northern borders of the USSR.

The "Star Wars" scheme is a highly dangerous miscalculation from a political, scientific-technical and military standpoint. This is the opinion of many foreign experts. They include highly-respected U.S. scientists and members of Congress, as well as administration and Pentagon officials. The majority of statements boil down to the conclusion that the proposed antimissile defense weapons are based on nonexisting technology, utilization of which is projected on an unprecedented scale, that they require unacceptable expenditures and, most important, that they do not protect the United States against a retaliatory strike.

The threat of nuclear war will increase greatly if Reagan's so-called "Strategic Defense Initiative" is implemented, for we are essentially dealing here not with defensive weapons but with weapons of aggression, the development of a nuclear first strike potential. It is an unprecedented and monstrous situation when one country's main "line of defense" is projected thousands of kilometers from that country's soil, while the weapons of this "defense" stand watch above another country's territory.

Who can give credence to the claim that the development of a large-scale antimissile defense system with elements of space basing will practically open up the way toward doing away with nuclear weapons? Particularly since the Pentagon is developing six new types of strategic offensive first-strike weapons: the MX and Midgetman intercontinental ballistic missiles, the Trident II sea-based strategic missile, the B-1 and Stealth heavy bombers, as well as air-launched, sea- and land-based cruise missiles.

Nor are the "defense proponents" in Washington daunted by the fact that the establishment of an all-encompassing antimissile defense system runs roughshod over the basic provisions of the ABM Treaty -- the pledge not to build a national AMB defense system as well as space-based antimissile defense systems and system components.

The U.S. hotheads are forgetting a simple truth: in response to attempts at space blackmail, the Soviet Union will do everything in its power to thwart the adventuristic plans of the potential aggressor.

3024
CSO: 9144/642

U.S. ACCUSED OF VIOLATING SPIRIT OF HELSINKI AGREEMENT

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 40-41

[Article, published under the heading "Tenth Anniversary of the Conference on Security and Cooperation in Europe": "Main Issue of Our Time"]

[Text] The Conference on Security and Cooperation in Europe, in which leaders of 33 European countries, the United States and Canada took part 10 years ago in Helsinki, was an event of enormous international significance. It represented an accumulation of many years of experience, energy and struggle by peoples for peace and social advance and created favorable opportunities for further movement forward by mankind.

Appraising the historic significance and political scope of this event, the CPSU Central Committee Politburo, the Presidium of the USSR Supreme Soviet and the USSR Council of Ministers emphasized: "The agreement reached as a result of this conference is in conformity with those principles of peaceful coexistence and international cooperation, peace and freedom of peoples which were elaborated by V. I. Lenin and which the Soviet State has championed throughout its entire period of existence."

This all-European conference of nations, convened as a result of initiatives put forth by the nations of the socialist community, supported by the countries of Europe as well as the United States and Canada, constituted a collectively essential political review and confirmation of the results of World War I, affirmed the fruitlessness and harmfulness of a policy from a position of strength and "cold war," and opened up new opportunities to accomplish the central task of our time -- strengthening of peace and the security of all peoples.

The Helsinki Conference unequivocally spoke out in favor of supplementing political detente with military detente and of effective measures leading to an ultimate goal of universal and total disarmament. In addition, the conference defined the directions and specific forms of expanding and increasing activeness of cooperation among the European nations in the area of the economy, science, technology, environmental protection, and in other domains of economic activity.

All these things taken together attest to the fact that the Conference on Security and Cooperation in Europe marked the beginning of a new stage of detente and constituted an important step along the road of consolidating the principles of peaceful coexistence and cooperation on the basis of equality between countries with differing social systems.

In the last decade, in conformity with the spirit and the letter of the Final Act of the All-European Conference and in conformity with its peace-seeking foreign policy, the Soviet Union has advanced a number of proposals, which on the whole have comprised a comprehensive, all-encompassing constructive program for military detente. It embraces a large number of important practical measures -- from a simple "freezing" of troop strengths and arms levels in Central Europe to their gradual substantial reduction; from mutual reduction of the military activities of the Warsaw Pact and NATO to complete disbandment of their military organizations; from new confidence-building measures to material steps at disarmament; from a treaty forswearing first use of nuclear and conventional arms against one another to convening a conference on military detente and disarmament in Europe; from reduction of military forces and quantity of nuclear weapons on European soil to their total elimination.

The Helsinki Final Act bears the signature of the United States and its NATO bloc partners. Together with other nations, they took upon themselves the solemn pledge to foster European peace and security, rapprochement and cooperation among the nations of Europe, deepening, development, and consolidation of the process of detente on the European continent.

But what has the actual policy of these countries, the United States in particular, proven to be as regards European issues?

Anticommunist circles of aggressive inclination among the leaders of the Western powers attended the Helsinki Conference with reluctance, under the pressure of the circumstances which had developed as a result of the struggle between the world systems, and under the influence of public opinion. Aware of the degree to which the position of the forces of peace, progress, and socialism would be strengthened after the conference, they formulated their plans with the aim first and foremost of reducing to a minimum its future positive consequences for the cause of peace, as well as attempting to utilize it to give detente an anti-Soviet directional thrust. For this reason they responded to materialization of detente with materialization of the spirit of "cold war" and by attempts to block the road toward a lessening of international tension and toward decreased danger of military confrontation.

To discredit the peace initiative of the USSR and the forces of peace, socialism and progress, the ideologues of the West did not fail to drag out the hoary myth of a "red danger," which appeared in their propaganda arsenal from the very first days of existence of the Soviet State. They gradually transformed the myth of a "red danger" into a myth of a "Soviet military threat." This phony lie pursues far from innocent aims: to slander the very essence of the socialist system and to portray the USSR as an aggressive state. With this they sought to prepare the ideological and political-psychological soil for embarking upon a phony policy of "defense" against

alleged "Soviet aggression" and sought to obtain gigantic appropriations for building up their military potential.

Aggressive U.S. militarist circles utilize the myth of a "Soviet military threat" to justify their attempts to disrupt the established balance of forces and to achieve military superiority by embarking upon another round of the arms race, including nuclear and space weaponry. This myth has now been transformed into one of the instruments of U.S. foreign policy and is utilized by that country in NATO bloc policy and in maintaining the U.S. hegemonist position in the capitalist world.

Washington is spending lavishly to improve and build up both its strategic offensive forces and its general-purpose forces, designated for the conduct of combat operations in Europe within the framework of the coalition strategy of the aggressive NATO bloc. Considerable attention is devoted to modernizing the Air Force. For example, the continuing deployment on the European continent of 572 U.S. cruise missiles and Pershing II ballistic missiles which come under the Air Force could tip the present overall balance of military-strategic parity in favor of imperialism and create a threat for the Warsaw Pact member nations. NATO joint air forces in Europe total more than 3,500 tactical combat aircraft. Deliveries of the latest, most advanced operational aircraft continue. A substantial portion of these aircraft constitute nuclear weapon delivery platforms.

Training of staffs and troops as well as testing of weapons and combat equipment take place in the course of numerous military maneuvers conducted by the United States and other NATO countries. In recent years they have assumed an unprecedented scale and have become difficult to distinguish from actual preparations for war. According to reports in the press, for example, more than 350,000 military personnel, approximately 15,000 tracked and wheeled vehicles, as many as 2,000 combat aircraft and approximately 300 naval ships of various types took part in the Autumn Forge 84 maneuvers. AWACS aircraft were also employed.

Exercises involving the air forces of the NATO bloc countries were held on an immense scale and with equally provocational aims. Activities included the massive launching of strategic bombers and actual [realnyy -- can also mean realistic] firings of ICBMs. Hundreds of such NATO exercises were held last year in Europe alone. They are also being conducted at the present time. They are distinguished by a clearly-marked political thrust and an undisguised militaristic show of force in close proximity to the borders of the Soviet Union and the other nations of the socialist community.

The facts indicate that the U.S. "contribution" to development of the Helsinki process includes heightening of military tension in Europe, deployment of new nuclear first-strike weapons on this continent, and attempts to place in question existing European realities, to disorganize and impede normal trade, economic, scientific and cultural cooperation in this region.

In this situation the Communist Party and Soviet Government are displaying firmness and resolve and are guided by Leninist principles in their foreign-policy activity.

The Soviet Union advocates settling disputes by means of peaceful negotiations and has demonstrated this by deeds over the course of the entire decade which has passed since the Conference on Security and Cooperation in Europe. It was noted at the April (1985) CPSU Central Committee Plenum that the intergovernmental documents of the period of detente, including the Helsinki Final Act, have not lost their significance. They represent an example of how it is possible to construct international relations if one is guided by the principles of equality and equal security, of prevailing world realities, if one does not endeavor to obtain any advantages but seeks mutually acceptable solutions and agreements. "It seems," it was emphasized at the Plenum, "that in connection with the 10th anniversary of the Conference on Security and Cooperation in Europe it would be beneficial for the will to overcome dangerous tension, toward development of peaceful cooperation and constructive elements in international affairs to be reiterated in Helsinki on behalf of the nations which signed the Final Act."

The CPSU and Soviet Government, consistently pursuing a constructive, peace-seeking policy and advocating development and deepening of detente, at the same time realistically appraise the situation in the international arena and are not unaware of the dangerous maneuvers on the part of reactionary forces and the potential threats to world peace which these forces are attempting to create. Preparing for the 27th CPSU Congress, the Communist Party calls upon the Soviet people and its Armed Forces, including military aviation personnel, to increase their political and military vigilance and to maintain constant readiness to take resolute countermeasures against any risky ventures on the part of the enemies of peace and progress.

3024
CSO: 9144/642

JOURNAL HOLDS SPECIAL EVENT IN LENINGRAD MILITARY DISTRICT

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) p 41

[Article by O. Mukhin, scientific secretary, Leningrad Section on History of Aviation and Space Exploration, USSR Academy of Sciences: "Oral Edition"]

[Text] The annual presentation of an oral edition of the journal AVIATSIYA I KOSMONAVTIKA at the Leningrad District Order of the Red Star Officers' Club imeni S. M. Kirov has become a tradition.

This year it was dedicated to the 40th anniversary of Victory of the Soviet people in the Great Patriotic War and to the 27th CPSU Congress. Members of the journal's editorial board, scientists, designers, veterans of the Air Forces, and veterans of the Great Patriotic War took part in it.

Proceedings were opened by Maj Gen Avn A. Baskakov, military council member and chief of the Air Forces political department of the Order of Lenin Leningrad Military District. Chief editor Col O. Nazarov discussed the tasks facing the journal's workforce in connection with preparations for the 27th CPSU Congress and their implementation. In recent issues of AVIATSIYA I KOSMONAVTIKA special emphasis has been placed on materials devoted to the 40th anniversary of the Great Victory, to the combat exploits of pilots of the war years, and to the workers on the home front, who built first-class combat equipment.

Air Forces veteran Maj Gen Avn (Ret) V. Puzeykin related the combat activities of the 127th Fighter Regiment, which he commanded from September 1941. His pilots provided escort protection to transport aircraft which were linking the blockaded city with the rest of the country. Fierce combat encounters were fought with the fascists almost daily. But the airlift functioned without interruption. This veteran's presentation was supplemented by clips from a movie about aviator exploits during the Great Patriotic War.

The journal's arts page was handled by Lenkontsert performing artist D. Yankovskaya. She presented several songs from the war years. Honored Performing Artist RSFSR L. Yeliseyev read some poems dedicated to the cosmonauts.

Doctor of Technical Sciences Professor V. Shkvartsov discussed the capabilities of modern computers in performing a broad range of tasks in science and industry.

Candidate of Medical Sciences I. Kolosov, who was involved in training the first Soviet cosmonauts, 25 years ago serving as a doctor at the Cosmonaut Training Center at Zvezdnyy Gorodok, shared his reminiscences of that unique time, devoting particular attention to the P. Belyayev and A. Leonov mission, during which the world's first spacewalk took place.

The final speaker was Hero of the Soviet Union Pilot-Cosmonaut USSR Lt Gen Avn G. Titov. Our second cosmonaut spent the early days of his officer's career in Leningrad. His flight log is preserved in the museum at the district Officers' Club. German Stepanovich told of the current achievements of the Soviet space program, missions flown in 1984, and answered numerous questions.

The journal's oral edition ended with a number by the Song and Dance Ensemble of the Order of Lenin Leningrad Military District.

3024
CSO: 9144/642

SCIENTIFIC OBSERVATION FROM MANNED ORBITAL CRAFT

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 42-43

[Article, published under the heading "The Space Program Serving Science and the Economy," by twice Hero of the Soviet Union Pilot-Cosmonaut USSR Col B. Volynov: "View From Orbit"]

[Text] We are approaching the 25th anniversary of the exploit of Yu. Gagarin, who ushered in the era of manned space flight. These past years have attested to planned and orderly accomplishment in the Soviet Union of a program of study and exploration of near-earth space for peaceful purposes. Today the space program constitutes a concentrated expression of the scientific and technological revolution which is in progress.

Space exploration is connected not only with solving pertinent scientific problems of the present day but also with prompt incorporation of scientific research results into the economy. Information obtained in the course of space research is of importance to our nation's economy. During their orbital station mission, for example, P. Klimuk and V. Sevastyanov photographed approximately 5.5 million square kilometers of Soviet territory. The calculated economic effect from utilizing this information by specialists in various branches and sectors of the economy exceeded 50 million rubles.

The work performed by crews on board manned spacecraft encompasses many areas. They include geological-geomorphological, meteorological, climatic, oceanographic investigations, and investigation of forest and soil resources. Naturally successful accomplishment of tasks for the benefit of the nation's economy is possible only on the basis of combined utilization both of unmanned and manned spacecraft. At the same time we are witnesses to the constantly growing role played by Salyut multipurpose manned orbital stations in accomplishing pertinent practical tasks.

Cosmonauts working on board the Salyut station, for example, returned to Earth with valuable materials for preparing various-scale maps of the Earth's surface and geodetic networks. They have obtained interesting data on the atmosphere and near-Earth space. Specialists are utilizing small-scale images obtained by cosmonauts to investigate the Earth's natural resources. A total of 67 promising areas for oil and gas exploration have been determined in the

vicinity of the Caspian Sea. In that same area 11 large crustal faults have been detected, at the intersections of which one can anticipate deposits of copper and other minerals.

As space technology has advanced, orbital stations have been furnished with diversified equipment for the purpose of expanding the volume and increasing the effectiveness of investigations performed by the crews. These include the MKF-6M multiple frequency band camera unit, the Spektr-15 spectrometer, the VPA-1 visual polarizing analyzer, the Duga electrophotometer with optical aiming system, etc. This enabled the crews manning the Salyut 6 orbital station to continue on an even higher scientific level the series of investigations to study the Earth environment and Earth resources. On the L. Popov and V. Ryumin mission, for example, experiments and studies in physical geography comprised perhaps the greatest work volume of all scheduled research activities.

Visual observations from the orbital station have become a component part of the program of investigation of Earth resources and the environment. They ensure the greatest efficiency in obtaining, transmitting, and utilizing information. This is persuasively attested by the 237-day mission flown by L. Kizim, V. Solovyev, and O. Atkov. The cosmonauts communicated results to the Earth directly during performance of observations or during a subsequent communications session. In most instances the information was utilized immediately. And this is very important. Data on the status of farm crops during the period of vegetation or ripening become outdated within 2-4 days, for example, and therefore require constant, regular updating.

In the conduct of investigations without such stringent demands pertaining to immediacy of communication, results of visual observations are utilized as a supplement to photographic information processed at a later time. This is typical of geological studies. From his vantage point on board the orbital station, a cosmonaut sees and can tie together separate, at first glance seemingly independent details of an area's geologic structure. Thus the view from orbit makes it possible to detect geologic structures which may contain deposits of various minerals.

The rate of pollution of the seas and oceans has increased to a threatening degree in the last decade. A monomolecular layer of hydrocarbons covering the surface of the ocean disturbs the normal interaction between the water medium and the atmosphere. The crews of the Salyut 7 - Soyuz orbital complex studied pollution of the ocean surface, pollution indicators, and dynamics of pollution movement. They noted down the conditions of observation, influence of ocean waves, the state of the atmosphere, and recorded polarization and spectral characteristics of light reflected from the polluted ocean surface.

One of the most important areas of investigation is observation of dust storms. Working together with specialists, cosmonauts investigate the influence of the structure and topography of the underlying surface on the magnitude of streams of dust and sand and the directions of their movement, determine points of origin of sandstorms in specified areas of observation, and determine the zones of origin and accumulation of the transported material. In summer the crews of orbital stations have repeatedly been

assigned and have successfully performed the task of early detection of forest fires and tracking of their progress.

An important place in the work performed by the crews of orbital complexes is occupied by development of methods of studying from space the state of the waters of large rivers, reservoirs, lakes, and inland seas. One can readily determine by color bodies of water which are being subjected to excessive growth of aquatic plants, especially in areas of intensive agricultural production. Repeated observations have been conducted of the Caspian and Aral Sea. Vast areas, up to 30-50 kilometers in width, of exposure of the Aral Sea bed, for example, can be seen from orbit. Spacecraft crews have spotted dust storms in this area and signs of salts being borne by the wind onto areas adjacent to the Aral Sea.

I have cited just a few examples which attest to the considerable practical results obtained from work performed on board the orbital station. Ways to achieve further increase in effectiveness of utilization of manned spacecraft for performing tasks of economic application are of course far from exhausted. Spaceborne equipment for observing and recording objects on the Earth's surface presently being used, as well as the very organization of observation processes do not yet enable us to utilize in full measure the advantages of the presence of man on board the orbital complex. It would be expedient to have a unified aggregate of spaceborne devices providing not only observation but also recording and processing of data. In order to improve the speed and efficiency of deciphering information and interpreting obtained data by cosmonaut personnel, these processes should be automated, employing an on-board computer.

Utilization of specific light and color filters during observations increases the contrasts of the target objects. This increases the effectiveness of performed investigations. A more active effort should be made further to develop this area of investigation, and scientific investigations should be performed on other items, in particular pertaining to determining the most informative spectral frequency bands, improving existing and developing new methods of observation and interpretation of images of various natural features. Accomplishment of these tasks is possible on the basis of analysis of spectral images obtained with the aid of the MKF-6M camera system and other such equipment.

Utilization of the infrared region of the spectrum will make it possible more efficiently to accomplish tasks connected with crop forecasting. Consideration of new information-providing features of these spectral bands should foster expansion of the range of tasks assigned to cosmonauts, such as enabling them to conduct investigation of earth resources independent of weather conditions.

As we know, color contrasts are one of the most important information-providing attributes on the basis of which cosmonauts evaluate objects on the Earth's surface. Color, however, is a parameter which does not easily lend itself to verbal description. Initial steps in the direction of making colorimetric evaluation of visual information more objective have already been taken. At the present time the crew of the Salyut 7 station has at its

disposal an ATs-1000 color atlas and a Tsvet-1 colorimeter. The next step would be providing the crew with a remote-sensing colorimeter with an image recording system, as well as installation of special optical focusing color charts on the optical equipment. All this will substantially improve the efficiency and effectiveness of performance of important scientific and economic tasks.

Crew work activities pertaining to observing the Earth's surface and ocean from space involve certain peculiarities dictated by such factors as the high velocity of movement of terrestrial objects in a cosmonaut's field of view and frequent alternations between land and sea, light and shadow. In addition, a cosmonaut is not merely an observer but a research scientist as well. All this requires thorough crew member theoretical training in the area of orbital physical geography. Even with cosmonaut specialization, the volume of knowledge, and rather diversified knowledge, such as in the areas of agriculture and forestry, geology, and oceanography, which they must possess, is very large. It is essential to have textbooks, color atlases, study guides and manuals, as well as specialized laboratories in the given subject area.

Improvement of methods of training ground specialists is a component element of improving effectiveness of utilization of manned orbital stations for the benefit of the economy. It is clearly time to establish specialized departments of orbital physical geography at appropriate higher educational institutions.

Resolution of the problems enumerated above will make it possible to increase the effectiveness of utilization of manned orbital stations in the interests of accomplishing important scientific and economic tasks.

3024
CSO: 9144/642

SOVIET MANNED SPACECRAFT SIMULATORS DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 44-45

[Article, published under the heading "Cosmonaut Training," by Candidates of Technical Sciences I. Pochkayev and V. Shuvalov, and Engineer Yu. Bakulov: "Simulators at Zvezdnyy"]

[Text] Combined and specialized simulators today constitute the principal technical means of cosmonaut training. This is due to the fact that cosmonauts, in contrast to pilots, are unable to train in actual conditions of flight. Even a person who has flown several missions in space needs a full extent of practice sessions in connection with changes in training programs and due to ground time between missions.

To develop skills in operating space systems and performing experiments, investigations and applied tasks in conditions approximating actual space, simulators are placed on a centrifuge, on board a flying laboratory, in the weightlessness simulation tank, in the hot room and the altitude chamber. Any training simulator can incorporate an operator station, instructor console with data recording equipment, devices simulating the external visual environment, on-board systems and flight dynamics, "spacecraft-earth" communications, as well as mission control communications.

The operator's work station is a spacecraft or orbital station compartment (aggregate of compartments or bays) with the requisite equipment. The work station and actual spacecraft or orbital station interiors are identical. A specialized simulator reproduces only part of the actual spacecraft interior.

External visual environment simulators reproduce the stars, Sun, Earth, Moon, and various space objects in optical and TV observation devices. The dynamic parameters of motion of images of the space background and objects are fed into the simulators by a flight dynamics model.

Instruments, annunciator displays, video monitors, reference input elements feeding discrete commands and analog parameters, gear for communicating with the training cosmonauts and simulator engineer-technician personnel, and information display equipment are mounted on the simulator monitoring and control console. Some are regular-equipment or simulator models. The console

continuously displays all information and the external visual environment observed by the crew members at their work stations and, when necessary, cosmonaut medical-biological parameters as well. A picture from TV cameras mounted at the operator work station is transmitted to one of the video monitors to provide visual observation of the spacecraft crew training session. Simulator devices or mathematical models simulate the operation of spacecraft (station) on-board systems in manual and automatic control modes.

In conformity with the instructor's commands or specified parameters, the on-board systems and flight dynamics models perform a sequential-parallel chain of logical conversions, the results of which are displayed at the cosmonaut crew work station: annunciator displays flash on or off, and instrument readings, velocities or directions of motion of the external environment images in the optical and TV observation devices change.

Orbital flight is also simulated by means of corresponding situation change in the observation instruments and viewing ports. For example, if the viewing port of the spacecraft or station is oriented toward the Earth, the cosmonaut will observe the "running of the Earth."

The design and structural differences between simulators are determined by the specific features and magnitude of tasks to be performed by a crew during flight. The simulator facilities at the Cosmonaut Training Center imeni Yu. A. Gagarin were constantly improving. One might say that they made the journey from a Voskhod simulator to a complicated multifunction simulator complex which trains crews for Soyuz T and Salyut 7 station missions.

The missions by the crews of V. Komarov and P. Belyayev demonstrated that man can not only operate a spacecraft in conditions of weightlessness and during descent from orbit with high G-loads, but can also perform work tasks in space. This made it possible to transition to the next, qualitatively new stage in space exploration -- docking two spacecraft in orbit. A team of specialists under the direction of N. Klishov designed and built a Soyuz docking simulator. It enabled two crews to practice the docking maneuver right up to the moment of physical contact in manual control mode from a distance of 150 meters.

To create a dynamic image of docking spacecraft, gimbal-mounted scale models were employed, traveling along guides in response to signals fed by a mathematical model of the relative motion of the spacecraft. Spacecraft relative motion equations and control system logic operations were solved on analog computers.

Crews practiced monitoring the operation of onboard systems and controlling the Soyuz spacecraft at all phases of a mission in a combined simulator. With the aid of electronic and electromechanical devices, it simulated the operation of spacecraft systems, with the external visual environment simulated by optical and TV devices. For example, an image of the Earth was produced by a movie projector, while the starry sky was produced by an optical-mechanical simulator with a gimbal-mounted black sphere to which small polished balls were affixed. Their diameters would be selected proportional to the luminosity of the stars being simulated. The mutual positioning of the

balls corresponded to the placement of stars in the Northern and Southern hemispheres.

Broadening and increasing complexity of the tasks performed by crews during a mission, as well as devising new scientific and applied experiments, the performance of which required precise orientation of the axes and viewing ports of the orbital complexes toward the stars, Earth and Sun, brought the necessity of applying in spacecraft simulator engineering fundamentally new, more precise methods of simulation and objective monitoring of crew work tasks.

Training Center specialists performed a large volume of theoretical and experimental studies to determine possibilities of utilizing digital simulation methods, designing and building multiple-computer control systems based on second-generation computers, and devised crew operator activity monitoring algorithms and methods of recording and display. The result was the Salyut station orientation simulator and a multicomputer analog-digital control computer system. On the basis of this simulator they developed astroorientation and Salyut station main control position simulators, a long-range rendezvous and docking approach simulator, and a Soyuz spacecraft orientation and motion control, docking approach and docking system simulator.

Mock-ups of the spacecraft docking transfer and work compartments of the Salyut station serve as work stations in these simulators. They are positioned vertically, in order to provide normal conditions for crew training.

Preparations began in 1972 for a first joint mission by Soviet cosmonauts and U.S. astronauts on the Soyuz and Apollo spacecraft. The Soyuz spacecraft was modified to ensure compatibility of docking assemblies, electronic and optical mutual detection and control devices. This correspondingly required substantial modification of the combined simulator. Things were complicated by the fact that crews were training at the same time for routine missions on the national program. It was therefore decided to build a simulator for the modified Soyuz M spacecraft for training Soviet and U.S. crews. It employed optical-mechanical simulators for reproducing the external space environment in optical and television equipment. Approximately 200 abnormal situations were programmed in the simulator to train crews to respond to onboard system failures and to emergency situations. Upon completion of the joint Soviet-U.S. mission, the simulator was upgraded to provide for training Soyuz spacecraft crews: the crew work station was modified, and appropriate changes were made in the onboard systems simulator devices.

A Soyuz T combined simulator was built at the Training Center in 1979. It included a regular onboard digital computer system. This required the development of a matching device to provide communication with the simulator equipment. An astrosimulator device was installed for detecting an orbital station at great distances and for accomplishing docking. It generates a point image of the station against the starry sky background. An analog-digital computer system provided capability to solve a large volume of mathematical and logical problems, which made it possible to replace onboard system simulator devices with mathematical models. This increased the

reliability of simulator operation and made it possible to more than double the number of simulated programmed abnormal situations.

Analyzing our experience in operating several simulators based on a single analog-digital system, we concluded that it was advisable to standardize the principal operating devices, to design and build an aggregate simulator system. Of course this conclusion was based on a number of scientific research studies conducted by Center experts.

Standardized devices are interlinked in the combined simulator system, and collective utilization of their resources is provided. Of course it also includes individual-use components, which either cannot be brought together, or where this would be too expensive. Development of common-use systems made it possible to automate the crew training process and to increase overall system reliability (by establishing redundancy of principal operating components).

This made it possible to add new operational components to the simulator complex. They provide automated monitoring of operator activities and of the psychophysiological state of cosmonaut personnel during training sessions. In addition, they provide capability objectively to evaluate cosmonaut performance taking into account energy and emotional expenditures (tension index), to plan and schedule the number and content of practice sessions in relation to degree of cosmonaut proficiency (mission readiness). The training schedule can flexibly be altered in relation to performance errors (adaptation of the training processes taking into account a cosmonaut's individual capabilities and state), while the number of simulatable emergency situations can be increased to 1,000.

Also convenient is the fact that the training control and management system can be adapted to the instructor's individual characteristics. Analysis of crew errors is facilitated due to recording and reproduction of the training session processes or individual session fragments. And, finally, adoption of backup common functional components has made it possible to increase the operational reliability of the simulator complex. The simulator complex for training Salyut 7 orbital station and Soyuz T transport spacecraft crews in manual approach and docking was built in 1982. The complex includes the following systems: computer, training session control and management, external visual environment simulation, psychophysiological monitoring, and "spacecraft-ground" communications simulation. In addition, we have a Salyut 7 station combined simulator and a specialized Soyuz T spacecraft and Salyut 7 orbital station docking simulator.

The computer system is based on the third-generation YeS-1033 computer. It is backed up by an SM-2M switching computer. The practice session control and management system is based on standardized monitoring and control display consoles.

To provide automated monitoring of crew performance, a subsystem was developed to provide objective evaluation of operator performance, which analyzes the degree to which it conforms to onboard documentation. Analysis results are communicated to the instructor on the monitoring and control console display,

and are recorded on alphanumeric printouts. The entire practice session process is stored in the computer's internal memory and video-tape recorded.

Data on the cosmonauts' physiological state are displayed on the flight surgeon's console. If the monitored parameter reaches the maximum allowable value, an additional warning flashes.

The simulator work stations are full-scale mock-ups of the Salyut 7 orbital station and the descent module of the Soyuz T spacecraft.

A centralized control operation organizes the work activities of engineer and technician personnel, controls and manages the simulator complex. The status of principal system components is continuously indicated on a display panel. In case of failure of a given component, the system automatically switches over to backup elements.

Transition to a simulator complex based on integration of principal devices makes it possible more fully to utilize its resources in cosmonaut training, to reduce the time required to build simulators for modified manned spacecraft, and to cut the costs of simulator operation.

3024
CSO: 9144/642

REMINISCENCES ABOUT SOVIET UNMANNED LUNAR MISSIONS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, Jul 85 (signed to press 3 Jun 85) pp 46-47

[Article, published under the heading "Readers Request," by B. Pokrovskiy, scientist, space command, control and telemetry complex: "Earth-Moon"]

> [Text] KIK is the abbreviated designation of the space command, control and telemetry complex. One of its components -- the Long-Range Space Communications Center -- deals chiefly in control, remote monitoring and receiving of information from unmanned vehicles investigating various celestial bodies. This article discusses the Center's operations involving "Luna" type equipment. The lunar exploration table is included at the request of reader I. Botov. It was prepared by N. Konkov.

I recall the year 1958. Rocket, space and ground hardware designers as well as administrative officials from scientific research institutes, design offices, and the space command, control and telemetry complex gathered for a meeting at a large old residence in Moscow. The assembled gathering applauded when Korolev took the floor. Sergey Pavlovich thanked the KIK people for a job well done.

"I shall now briefly tell you what our design office is currently working on and what all of you soon will be working with," Korolev made a brief gesture with a his left hand, as if inviting everybody to gather closer, and went on: "The next item on the agenda is a rocket flight to the moon, flight around the moon with return to Earth, and landing on the Moon...."

His every word fairly radiated inspiration and profound faith in the success of this enormous project which was being undertaken. He emphasized the specific features of lunar missions and articulated specific KIK tasks: to ensure reliable trajectory monitoring in order to confirm the fact of impacting on or swinging around the Moon.

Construction on a Soviet unmanned interplanetary probe flight control facility soon commenced on Koshka Mountain near Simeiz. This was essentially the first phase of establishment of a Long-Range Space Communications Center. A good site was selected: maximum radio communications line-of-sight coverage (the

south slope of the mountain on which the Center was sited faces the sea), while radio interference is minimal. And the neighbors are highly appropriate -- a branch of the Crimean Observatory and a scientific station of the USSR Academy of Sciences Institute of Physics. It was decided not to erect major permanent-type buildings, since too little time remained to the first "Lunnik" launch date. Nor was there any necessity, for the Center's permanent buildings were already planned for a site in a more promising flatland area of the Crimea.

The manufacturers mounted the equipment in small enclosed structures on wheels and towed them to the site. On-site operations were supervised by Doctor of Technical Sciences Ye. Boguslavskiy (subsequently Hero of Socialist Labor, Lenin Prize recipient), engineer G. Sytsko, and N. Bugayev, director of one of the KIK's southern facilities. They handled literally everything -- training of young engineers, technicians, and equipment operators, installation and initial setup adjustment of equipment, housing of personnel, and organization of personnel meal service.

Individual and combined practice sessions were conducted after site installation work was completed. In place of signals from an actual rocket, they received specially attenuated signals from a transmitter placed at the top of an alignment and adjustment tower. To this day checks on proficiency and smoothness of team operations and interaction of hardware within a station, as well as between several stations or the entire complex as a whole are still called trenirovki [practice sessions, training sessions, workouts] at KIK.

On 2 January 1959 a rocket was launched from the Baykonur Space Launch Center, for the first time in the history of man accelerating to escape velocity a man-made celestial body. The KIK lunar vanguard on Koshka Mountain precisely measured the parameters of motion of the world's first unmanned space probe and received telemetric information from it.

For more than 60 hours the Earth maintained stable communications with the interplanetary explorer at a distance in excess of half a million kilometers. At the time this was a world distance record for radio communications. The vehicle flew past the Moon at a distance of several thousand kilometers and transmitted valuable scientific information back to Earth. The press called the solar system's first man-made planet "Mechta" [Dream].

Another rocket was launched on 12 September of that same year. On 14 September, at 0002 hours and 24 seconds, the Koshka facility received a transmission indicating that the vehicle had landed in the Mare Serenitatis area.

Preparations for the third "Lunnik" mission were the object of particular attention on the part of all KIK personnel, especially the specialists working in the Crimea. It was to photograph the far side of the Moon and transmit the pictures back to Earth. Following the launch of Luna 3, scientists and design engineers flew in to Koshka from Baykonur. They proceeded to the command center -- a temporary wooden structure (like everything else on Koshka). Work proceeded smoothly day and night, determined by the scheduled communications

sessions with Luna 3. The results of each session were discussed at technical meetings, which as a rule were chaired by the Chief Designer.

The space vehicle flew around the Moon and photographed its far side. When it had approached the Earth to a distance of 40,000 kilometers, the Luna 3 - Koshka Mountain radio link was switched on. Priceless images, broken down into immense numbers of radio signals, proceeded to the Earth at the speed of light.

Those present at the following meeting were quite tense and nervous. Suddenly the silence was broken by one of the astronomers, who stated to Korolev that there was no need to be nervous, for there would be no photographs: radiation had undoubtedly ruined the film. Korolev maintained silence.

Finally the first, still wet picture was brought from the photo laboratory. Sergey Pavlovich took it and said with measured voice, which was typical of him: "Well, what do we have here?"

Everybody crowded around Keldysh and Korolev, silently perusing the photograph. Suddenly Sergey Pavlovich turned, summoned the laboratory assistant, and whispered something to him. The latter left the room and soon returned with another photograph. On the back of that photograph Korolev wrote in his bold handwriting: "To esteemed.... The first photograph of the far side of the Moon, which was not supposed to have come out. Korolev. 7 October 1959." Sergey Pavlovich stood up and handed the photograph to that astronomer.

On 27 October 1959 this photograph of the far side of the Moon, which had never before been seen by man, was published in the newspapers.

Henceforth each time a "Lunnik" was launched, S. Korolev would fly to the Center, which had been relocated to a new site, to take part in mission control activities. He last visited the Center on 7 December 1965, when the phase of completing a lunar soft landing system had been completed on the Luna 8. Subsequent development of unmanned probes was continued by his students and successors at another design office, to which he had passed on the technical documentation on the "Lunniks" prior to his death. Work at the other design office was directed by G. Babakin (subsequently Hero of Socialist Labor, Lenin Prize recipient, corresponding member of the USSR Academy of Sciences).

A total of 16 unmanned Luna vehicles were launched between January 1966 and August 1976. Fundamentally new tasks were accomplished with their assistance: a soft landing on the Moon and return of lunar soil to the Earth. Lenin Prize recipient A. Bolshoy and other veteran experts directed the unmanned vehicle mission control operations.

Table of Launchings of Soviet Luna Unmanned Lunar Probes

Probe	Date of Launch	Principal Mission Data
Luna 1	2 January 1959	On 4 January flew past the Moon at a distance of 6,000 km.
Luna 2	12 September 1959	On 14 September it reached the lunar surface in the Mare Serenitatis area.
Luna 3	4 October 1959	On 7 October photographed the far side of the Moon.
Luna 4	2 April 1963	On 6 April flew past the Moon at a distance of 8,500 km.
Luna 5	9 May 1965	On 12 May reached the lunar surface in the Mare Serenitatis area.
Luna 6	8 June 1965	Flew past the Moon and entered a heliocentric orbit.
Luna 7	4 October 1965	On 8 October reached the lunar surface in the Ocean of Storms area.
Luna 8	3 December 1965	On 7 December reached the Moon at a point with coordinates 9 degrees 8 minutes north latitude, 63 degrees 18 minutes west longitude.
Luna 9	31 January 1966	On 3 February accomplished a soft landing in the Ocean of Storms area, at a point with coordinates 7 degrees 8 minutes north latitude, 64 degrees 22 minutes west longitude. Took a series of panoramic photographs.
Luna 10	31 March 1966	On 3 April it went into lunar orbit.
Luna 11	24 August 1966	Went into lunar orbit on 28 August.
Luna 12	22 October 1966	Went into lunar orbit on 25 October.
Luna 13	21 December 1966	Made a soft landing on 24 December at point with coordinates 18 degrees 52 minutes north latitude, 62 degrees 3 minutes west longitude. Transmitted panoramic TV images of the lunar surface. Performed tests on lunar soil.
Luna 14	7 April 1968	Went into lunar orbit on 10 April.
Luna 15	13 July 1969	Went into lunar orbit on 17 July. Went into a descent trajectory on 21 July and reached the lunar surface.
Luna 16	12 September 1970	Made a soft landing in the Mare Fecunditatis area on 20 September at a point with coordinates 0 degrees 41 minutes south latitude, 56 degrees 18 minutes west [sic] longitude. A sample of lunar soil was returned to the Earth on 24 September.
Luna 17	10 November 1970	Made a soft landing on 17 November in the Mare Imbrium at a point with coordinates 38 degrees 17 minutes north latitude, 35 degrees west longitude, placing the Lunokhod 1 mobile scientific laboratory on the lunar surface. Lunokhod 1 completed its program of investigations on 4 October 1971.

Luna 18	2 September 1971	Landed in the vicinity of Mare Fecunditatis on 11 September, at a point with coordinates 3 degrees 34 minutes north latitude, 56 degrees 30 minutes east longitude.
Luna 19	28 September 1971	This probe went into a circular lunar orbit on 3 October, for the purpose of investigating the Moon's gravitational field, taking TV pictures.
Luna 20	14 February 1972	Made a soft landing on 21 February at a point with coordinates 3 degrees 32 minutes north latitude, 56 degrees 33 minutes east longitude. Lunar soil was returned to the Earth on 25 February.
Luna 21	8 January 1973	Accomplished a soft landing in the vicinity of Mare Serenitatis on 18 January, at a point with coordinates 25 degrees 51 minutes north latitude, 30 degrees 27 minutes east longitude, placing the Earth-controlled Lunokhod 2 self-propelled scientific laboratory on the lunar surface. Laser lunar position finding and ranging was performed.
Luna 22	29 May 1974	Entered lunar orbit on 2 June. Took TV pictures of the lunar surface, performed orbital correction burns.
Luna 23	28 October 1974	Landed on 6 November in the southern part of Mare Crisium.
Luna 24	9 August 1976	Made a soft landing in Mare Crisium on 18 August, at a point with coordinates 12 degrees 45 minutes north latitude, 62 degrees 12 minutes east longitude. Bored into the soil to a depth of approximately 2 meters. Soil samples were returned to the Earth on 22 August.

Even more complex problems had to be solved by controllers when not just new but the very latest hardware, as Babakin put it -- the Lunokhod -- was delivered to the lunar surface. Prior to these vehicles, investigations on the lunar surface were of comparatively brief duration -- up to 7 days (Luna 13) an area-limited to the landing site. But the two lunar rover vehicles operated on the lunar surface a total of more than 1 year, traveling during this time across 48 kilometers of trackless lunar surface, and transmitted to the Center 286 panoramic photographs and TV images, more than 100,000 individual frames, and the results of lunar soil analysis at hundreds of points ranging from several meters to tens of kilometers distant from one another.

Control of the operation and particularly the movement of the lunar rover vehicles was a totally new, highly complex task performed by the Center. Judge for yourselves. The driver of a moving car sees the road situation from the interior of the vehicle in a three-dimensional color image, so to speak, and gains his bearings on familiar objects. The vehicle immediately responds to his control actions. The crew of a lunar "car" faces different conditions. It is controlling the movement of a four-axle vehicle across virgin ground containing no familiar landmarks, and it observes the road situation from a

two-dimensional black-and-white image on a TV screen. In addition, the driver's seat is located at a distance of approximately 385,000 kilometers. Therefore the "driver" sees the vehicle's response to his commands on the screen after a delay of 2.6 seconds.

But what if the rover vehicle drives into a crater or onto a hillock? Its highly-directional antenna will deflect, and communication with the Earth may be broken. In order to ensure that this did not happen, the antenna operator (the crew contained such a position) closely watched the position of his charge and continuously adjusted its aim, precisely conforming his actions to those of the "driver." The flight engineer telemetry-monitored operation of the motors (there were eight of them, one on each wheel), the other mechanisms and systems. If an abnormal situation arose, he would immediately take steps to correct it. In short, control of a mobile laboratory is a complex and highly sophisticated business, for a single mistake is enough to bring to an end the entire magnificent experiment.

During performance of critical operations, emotional stress on the part of the controllers, as was attested by the doctors who continuously monitored their state, increased their blood pressure and pulse beat to the level observed in a veteran airline pilot making an instrument landing at night. For this reason the Lunokhod missions were preceded by a great deal of preparatory work at the Long-Range Space Communications Center. Crews trained and practiced for months, working together with design office experts to teach the lunar rover vehicles to travel across a special area set up at the Center -- a model of the lunar surface. Actions by men and machine were honed to a smooth automatism. Thus the Long-Range Space Communications Center also became a unique proving ground for performing ground tests on unique space hardware.

The Long-Range Space Communications Center has made in recent years an invaluable contribution toward knowledge of the universe. New tasks lie ahead. Deep space is indeed "just around the corner," as S. P. Korolev put it, with the equipment with which the Center and the Space Command, Control and Telemetry Complex as a whole are presently equipped.

3024
CSO: 9144/642

- END -